75

CONTRIBUTIONS

to

WESTERN BOTANY,

NO. 14.

by

MARCUS E. JONES A. M.

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NEW SPECIES AND NOTES.

Grass Notes

Piper, in his Flora of Washington, gives Danthonia Californica Bol. as Proc Cal. Acad. 2 182 1858–62. It should be 1863.

On page 127 he gives Melica stricta in the key and leaves it out of the text.

On page 132 he gives Poa leptocoma as published in 1830, but it was 1832

On the same page he gives Poa Canbyi as his own, when it is Howell Fl. 764.

On page 147 he gives Agropyron Richardsonii as published by Schrader in Shear's Bull. Div. Ag. 4 1897, when it was published in Linnæa 12 467 1838.

On the same page he quotes Agropyron biflorum Brign., when it should be Triticum.

On page 148 he has Triticum caninum var. Gmelini as published in Ledebour's Fl. Ross. pl. 248. There are no plates in that Flora. It should be his Icones.

On page 122 he quotes correctly Scribner's impossible Danthonia thermale, and on page 148 incorrectly quotes Scribner's equally impossible Elymus saxicolus.

Under Melica in the key he has transposed the characters of M. Smithii and M. aristata.

On page 150 he gives Elymus arenarius under grasses without running rootstocks, while it is the reverse.

Sitanion, Elymus and Agropyron he mixes up so much that

no one by following him can tell to which genus certain plants belong. Agropyron saxicola and flexuosum are evidently species of Elymus of the section Sitanion, along with A. Scribneri. Elymus triticoides is evidently a hybrid between E. condensatus and the creeping species of Agropyron, as is shown even by slight field-work.

In the new Gray's Manual, Hitchcock is generally accurate, but on page 168 he gives Hordeum nodosum with awns only 1–1.5 mm. instead of 1–1.5 cm. long.

In going over our western grasses it has required a critical examination of Beal's excellent work, Grasses of North America. Anyone attempting to publish knows how exasperating are his own and the compositor's combined blunders. It is a real service to those who follow to correct them. In this spirit I offer these corrections.

On page 45 he has Andropogon tener with a stipe 3–6 cm. instead of mm. long, and glumes 4–5 cm. instead of mm.

Hilaria is given as published in 1815 when it should be 1816. On page 68 H. cenchroides has spikelets about 5 mm. not 5 cm. long as given

On page 72 Ægopogon gemmiflorus is given as published in 1815 when it should be 1820.

On page 74 Nazia occidentalis is quoted as having been gathered by me in Colorado, when it should be Arizona. It has spike–5–8 cm., not mm. long as given.

On page 93 Paspalum distichum is given as distichium.

On page 102 Eriochloa sericea is given as perennial, which is is very doubtful. On the next page E. punctata is also called perennial, when it is annual.

On page 104 Panicum is given as first published in L. Sp. Pl. when it was in the Systema and later in the Genera. Beal does not follow the Brittonian code.

Under Chamæraphis he says the species are annual, but C. caudata is perennial though blooming the first year.

Under Aristida barbata, page 199, "lateral awns" should be terminal or central, and "central" should be lateral. On page 202 A. Palmeri is given as collected by me in Colorado, when it should be Albuquerque New Mexico. On page 205 A. Americana is given as from Colorado by Orcutt, when it should be the Colorado desert California. which reminds one of Coulter's amusing blunder in his Flora of Texas page 434 where the understudy who wrote it did not know the difference between the Trinity mountains of Texas and those of Nevada, in copying from Watson's revision the descriptions of the two species Allium bisceptrum and A. Neva–

which
dense referred to there, do not grow within 1000 miles of Texas.

On page 209 A. grac. is correctly given as published in 1842. the Kew Index errs. On the same page A. divergens has an "arm"

On page 216 Stipa mucronata is given as published in 1815, instead of 1816. On page221 the crown of hairs on S. eminens is given as 5–6 mm. long, which is not correct.

On page 224 Oryzopsis caduca has "the outer glume a little shorter", it should be longer. Lower down the genus is said to have caducous awns, but in O. exigua they are not so. On page 230 O. erecta is given as published in Bot. Gaz. 15 112. but it was published there as O. Pringlei. O. fimbriata, on the next page, was published in 1885, not "1880", and Stipa fimbriata in 1816 not 1815. Its awn is given below as 1.5–2 mm. instead of cm. long.

Under Muhlenbergia the lower glume is given as 1–nerved, when it is often 2–nerved. He gives the upper as having 1–3 nerves, they are often 5. On page 237 No. 24 the word "awn" is omitted, it also should be 1–3 cm., not "mm." long. M. Schaffneri was published in 1885, not 1880. On page 243 M. firma is given leaves 1–15 mm. wide, it should be 1–1.5 mm. On page 247 M. Buckleyana should be M. Texana Buckley. On page 257 under M. parviglumis "Brit. Am. 71 1890" is unintelligble. Two lines below lacerate is spelled "lascerate" and many times afterwards elsewhere, On page 261 M Reverchoni is given as published in 1882, it should be 1892. On page 272 M. Lemmoni has the unintelligible "Brit. Am. 69 1890" again. On page 264 M. implicata should be (Spreng) Trin., not "(Willd) Trin". On page 265 M pauciflora has awns 8–12mm., not "cm" long.

Under Bealia on page 268 the awn should be 1–1.5 cm. long, not "mm".

On page 277 last line of key "9 mm." is an error.

On page 279 Alopecurus Californicus was not published in "1886" but 1888. The same is true of Sporobolus interruptus on page 286.

On page 289 S. "inflatus" should be ligulatus. S. cryptandrus var strictus has stems 10–20 dm., not "cm." long On the page under S. cryptandrus, eighth line, "entire" is an error.

O page 312 Polypogon Monspeliensis was published not as given, but on page 61 as Alopecurus.

On page 345 under Calamagrostis kœlerioides the leaves have a pungent, not "punctate" tip, and the spikelets are 4–5 mm., not cm. long.

On page 363 Deschampsia is given as perennial, but D. dan–

thonioides is annual. On pages 367 and 370 he gives D. danthonioides as a synonym of D. calycina, and yet keeps up both species. On page 368 he lets D. cæspitosa have a panicle only 1–3 cm. long when it should be dm. long.

In the key on page 373 "(i)" should be "(f)". Just below this No. 10 is wholly omitted.

On page 374 Avena deyeuxioides should be of 1816, not 1815. The same is true of A. elongata on the next page.

On page 379 the collector was not the beef extract man, Leibig, but my old friend and acute collector, Leiberg.

On page 397 the last line, "first glume" should be second glume.
and on the next page "second" should be first.

On page 399 Spartina gracilis should be of Trin. Mem. Ac. Pet. (6) 2 110 1840 and not as given.

On page 403 he again copies the common blunder of HBK. Nov. Gen. & Sp. being of 1815 instead of 1816, as to date of actual publication of first part.

On page 404 "musquite" should be mesquit, but is pronounced meskeet.

On page 406 "1815" should be 1816, and on page 410 second line "1880" should be 1885.

On page 413 he spells mesquit "musquit-grass".

On page 415 Bouteloua prostrata is given as of Lag. Variad. Cienc. 2 141, instead of 2 4 141. On page 418 var. ramosa was published in 1890, not 1891. On page 425 the lemma of the misspelled B. Alamosana should be 3-nerved, not 5-nerved. Below it B. aristidoides, as Dinebra, should be Nov. Gen. & Sp. 1 171, and not as given, and the date 1816. The figure on page 427 is probably B. triathera, certainly not B. Texana.

On page 437 Chloris dubia should be 1816, not 1815.

On page 450, under Cathestecum "neutral with a second rudiment in the terminal spikelet" should be erased.

On page 462 where we should find the genus Eremochloe, it is missing, nor is it in the book.

On page 468 1815 should be 1816. On the next page, after Sieglingia albescens the following should be inserted, "Tricuspis albescens Munro Proc. Phil. Acad. 335 1863".

On page 471, two lines above S. mutica, "are identical" should be are not identical. On the page before, second line from bottom "2.5 cm." should be mm.

On page 473, the second line above Dissanthelium, "1–2 mm." should be 3–5 mm., the error arising from changing lines to mm.

On page 482 the punctuation would lead one to refer "1–4 cm. long" to the spikes and not the pedicels to which it belongs. The same error is found under E. tenuis on the next page. On page 484 E. sessilispscata should drop the "ta". D rigida, in the line below, was published in 1885, not "1855". On the next page "E. Neo–Mexicana Vasey ined (?)" should be Coulter Fl. Texas 542 1894. On page 487 E. curtipedicellata was published in 1863, not "1862"

On page 491 Eatonia hybrida Vasey is given as published in Bot Gaz. 9 165 1884. No such name was published there.

On page 508 Melica bulbosa has two references and was not described in either place. On the same page under M. arıstata the ligule is given as "4–6 cm. long", pretty long for a ligule ! In the line below "plumose" is evidently an error for something else.

On page 539 Poa Sandbergii is given as a synonym of P. filifolia which it is not. Below, on the same page, P. occidentalis V & S. is given as a synonym of P. trivialis var. occidentalis Vasey which it is not. On page 549 he gives P glumaris as the same as P. Kingii Watson, but it is not. Later on he redescribes it as Festuca confinis Vasey, when it is not a Festuca. (See below).

On page 567 Glyceria nervata is given as published in 1831, iustead of 1830.

On page 578, under Atropis Pringlei, he gives the leaves as "7–10 mm.", instead of .7–1 mm. wide. On the next to the last line on the next page "3–4 cm." should be mm.

On page 636 in Agropyron dasystachyum the joints "of rachilla" should be rachis.

These corrections are not intended as criticisms. Errors in citations in a monograph are propagated greatly by those without access to the books, and by that growing class, people too lazy to verify their references. Nelson in his manual has copied some of these errors.

EPICAMPES.

In working up this and allied genera the treatment accorded by Vasey, Beal and Scribner seemed unsound, since about three genera were confused.

Epicampes was founded by Presl in Rel. Hænkeana 235 t. 29. Beal gives this as a synonym of Crypsis stricta HBK., but on what authority he does not state, while his description is quite different from Presl's figure and description. Presl does not give his species as having been previously described. His figure has the panicle of the E. distichophylla of Vasey which is Muhlenbergia

Vaseyana Scribner, but his glumes are elliptical, acutish and entire and rather shortly pubescent, but those of Vaseyana are scabrous and erose to toothed. The lemma is lead–colored, a characteristic of Muhlenbergia. the awn however is very different. Presl's is a simple prolongation of the midrib, from a broad notch caused by the slight extension of the sides of the lemma as lobes, as to the figure, but Kunth in his Agrostigraphia 209 says "nervo medio sub apice in aristam excedente", or that the awn comes out below the tip, and it is noticeable that he keeps only those species with such awns in the genus. He, however, blunders by putting E. macroura in Cinna which has the awn on the back also, while E. macroura is a Crypsinna, see below. Except for Presl's figure varying somewhat his E. stricta and Podosæmum distichophyllnm are the same. We know that this species has both entire and notched glumes and that the awn is also short or absent in some forms. As to Bealia, which is congeneric with Epicampes, we find it founded on a weak annual, B. Mexicana, while this genus has all robust perennials, but Beal himself rightly considers this as of little note by putting B. speciosa here. Epicampes (and including Bealia) is characterized by the (mostly) ivory–white glumes being cylindrical, rather stiff but not ribbed, faintly if at all nerved, erose to variously toothed at tip, scarious or rarely hairy, about as long as lemma and embracing it. The lemma is rigid, 3–nerved, oblong to lanceolate, hairy mostly below. The specialized awn arises from just below the tip and below the lobes, forming an offset from the midrib as a raised process which in most species extends down toward the middle fo the lemma as a raised and thickened rib which becomes a simple rib below. In some species the awn is reduced to a mere knob, but in most species it is a flexuous, purple, scabrous awn, nearly an inch long. Fournier evidently recognized the distinction for he separated E. macroura and stricta from it. Bentham in Journ. Linn. Soc. 19 seems to have failed to recognize the characters, since he describes E. rigens which is a Crypsinna. The species of Epicampes are as follows.

Epicampes stricta Presl.

Epicampes stricta var. distichophylla (Presl.)

This is Podosæmum distichophyllum Presl. Rel. Hænke. 231 and Muhlenbergia Vaseyana Scribner and M. Emersleyi Vasey. It is a form with long–awned lemma and lacerate–tipped glumes.

Epicampes stricta var. mutica (Ruprecht.)

This is Epicampes distichophylla var. mutica (Rupr.) Scribner E. mutica Rupr. Bull. Acad. Brux. 9 2 230, at least so far as my No. " 4219" (really 4290) is concerned. For a long time this has

been considered as a sterile form of E. Emersleyi but I have plenty of material with fertile florets. The general habit is that of Emersleyi but the florets are oblong, the glumes ovate to lanceolate or sometimes obloug, mostly acute and even short–awned, though in the number cited they are erose and obtuse, mostly a little shorter than the lemma, mostly evidently nerved. The lemma is oblong with the nerves close together, very scabrous but not hairy the awn a mere thickening of the central nerve at the tip or a knob or a fine awn nearly as long as the lemma. The sterile forms are without awns. This is E ligulata Scribner and it abounds from Black's Peak New Mexico (Diehl) both eastward and westward through Arizona to the San Jacinto Mts. California and southward.

Epicampes Bourgæi (Fourn.).

Muhlenbergia Bourgæi Fourn. in Hemsl. Bot. Cent. Am. 3 539.

Epicampes Bourgæi var. grandis (Vasey).

This is Muhlenbergia grandis Vasey Cont. Nat. Herb. 1 283.

Epicampes speciosa (Vasey).

This is Muhlenbergia speciosa Vasey, Torr. Bull. 13 231.

Epicampes Mexicana (Scribner).

This is Bealia Mexicana Scribner in Hackel True Grasses.

Epicampes argentea (Vasey).

This is Muhlenbergia argentea Vasey. Torr. Bull. 13 232.

Epicampes pubescens (HBK.).

This is Agrostis pubescens HBK. Nov. Gen. & Sp. 1 136. A. lanata HBK. is a synonym. Beal, Hemsley and the Kew Index all err in crediting this to Presl under Epicampes, in Rel. Hænke. 1 235 for "Huic generi adnumeranda quoque Agrostis pubescens et lanata" does not constitute publication, any more than similar names by Bentham & Hooker did in other grass genera in their Genera Plantarum.

Epicampes anomala Scribner probably belongs here.

Epicampes Clomena (Trin.).

This is Muhlenbergia Clomena Trin. Unifl 194.

CRYPSINNA.

From the work of Presl, Kunth and Fournier it seems best to rest this genus on those species with rat–tail–like spikes a foot or two long, having the Muhlenbergioid florets and the coarse and rigid thick leaves and long–acuminate and flat or involute with coarse ribs. The rays are very short (except the very lowest) and

single, coming from ribs on the sulcate rachis, the spikelets being on flexuous but not colored and rather stout and short pedicels. The floral scales are scabrous. The species of Crypsinna are:

Crypsinna stricta (Presl) Fourn.

Crypsinna macroura (HBK.) Fourn. which is Crypsis of HBK. and Cinna Kunth. This differs from rigens in the long ligule. The oblong–lanceolate glumes are about 5 mm. long or more and longer than the lemma normally, though sometimes a little shorter. The glumes are sometimes short–awned.

Crypsinna rigens (Benth.). Epicampes rigens Benth. Journ. Linn. Soc. 19 88. This differs from the species described below in the short and setaceous leaves, the panicle 1–2 dm. long and rarely over 5 mm. wide. The glumes are lanceolate to narrowly elliptical, acutish, $\frac{1}{2}$–$\frac{2}{3}$ the lemma.

Crypsinna setigulmis n. sp.

Stems round, smooth, 4–8 mm. thick below, strict, 3–4 ft. high, simple. Sheaths rather loose, coarse, rounded, the upper partly inclosing the panicle, rather many. Ligule rigid, about 2–3 mm. long, much wider than long, split. Leaves closely involute from the first and about 2 mm. wide, rigid and thick, long–acuminate and scabrous, about 2 ft. long, with age flattening out and becoming 4–6 mm. wide Panicle 1–2 ft. long, acuminate, very compact, about 1 cm. wide, nearly white, the rays and pedicels very short and closely appressed. Glumes white and very thin, scabrous, subulate as if awned, about equal, 7–8 mm. long. Lemma linear–subulate, lead–colored, scabrous, the tip with 2 short and oblong, white ears, rarely mucronate by a slight production of the midrib, about 5 mm. long, much shorter than the glumes and closely invested by them, rigid. Palet about as long as lemma and like it. This seems to differ sufficiently from C. stricta. Marsh Lake Sierra Madre Mts. Chihuahua Mexico near Garcia in dry pine woods, Middle Temperate Life Zone, Sept. 1903.

Crypsinna breviglumis n. sp.

Much like the above in habit and character except that the leaves are about 3 ft. long, flat from the first and very coarse and thick on the lower third, the rest tardily involute and 1–2 mm. wide, tapering to a fine point. The panicle as in the last, but the glumes oval to ovate, about 2 mm. long and $\frac{1}{2}$–$\frac{1}{3}$ the lemma, white, rounded and very obtuse, a little erose, rarely ovate and with midrib produced as a short mucro or awn, the upper acute and a little longer and slightly narrowed. Lemma linear–lanceolate, firm, rather dark above, acute, the lobes almost none, midrib produced as long mucro or short and straight awn. Glumes and lemma very sca–

brous. Palet as long as the lemma, similar. Guayanopa Canon, Sierra Madrre Mts. Chihuahua, Mexico, Sept. 1903, Lower Temperate Life Zone.

Calamagrostis purpurascens var. Vaseyi (Beal).

This is C. Vaseyi Beal Gr. 2 344.

Calamagrostis neglecta var. hyperborea (Lange).

This is C. hyperborea Lange Fl. Dan. 50.

Calamagrostis neglecta var. inexpansa (Gray).

This is C. inexpansa Gray Gram & Cyp. 20 and C. confinis Gr.

Calamagrostis Langsdorffii var. Scribneri (Beal).

This is C. Scribneri Beal Gr. 2 343.

Calamagrostis micrantha var. Sierræ n. var.

Stems rather robust, abont 3 ft. high. Leaves about 4 mm. wide. panicle 1–2 dm. long, loose, about 2 cm. wide, strict. Awn rudimentary or very short and scarcely visible. Prattville and Susanville Cal., under pines, Middle Temperate Life Zone.

Calamovilfa poæformis (Four.).

This I assume is Cinnastrum poæformis Fourn. Mex. Pl. Enum. Gram. 90 from the description, but my species shall rest on my characters given below. Stems tufted and slender, about 3 ft. high. Root leaves several, coarse, thick, scabrous, involute, abont 2 ft. long. Stem leaf one, about 2 ft. long, with coarse sheath, with short and nearly entire ligule 1–3 mm. long, blade about 1 dm. long, involute, 1–2 mm. wide, sharp Stems simple, slender, a little longer than the leaf. Panicle very loose and open, exserted, about a foot long. Rays drooping, flexuous, nearly capillary, about 5 together, the longest ofte 5 cm. long to the first branch (the nodes distant), then several–rayed and with raylets loosely flowered above the middle. Florets on slender pedicels not longer than themselves. Glumes unequal, the lower 1–nerved and strongly scabrous, the upper longer and 3–nerved, flattened, thin, minutely scabrous, li ear–lanceolate, acute, about 6 mm. long. Lemma nearly as long as glumes, hyaline, split into 2 long teeth, scabrous, slightly nerved, awnle-s, with a few setæ at base which are about ½ as long. Rudiment none. Palet a little shorter than lemma. This has much the appearance of a Poa or a Festuca of the occidentalis class. Volcano of Colima Mexico, July 13 1892, No. 478a, growing among pines on the slopes, Middle Temperate Life Zone.

Sporobolus capillipes n. sp.

Stems much branched throughout, with large panicles from nearly every sheath and partly included. Sheaths in the type longer than the short internodes, spreading. Leaves hradly 8 cm. long, 2–3 mm. wide, shortly acuminate, flat. Panicle often a foot long, oval–

ovate to lanceolate. The many rays mostly single, straight and somewhat ascending, rigid, 2–5 cm. long, with many cobweb–like pedicels divaricate at right angles and nodding or flexuous and a–bout 1 cm. long. Glumes oval, obtuse, $\frac{1}{2}$–$\frac{2}{3}$ the lemma, smooth. Lemma oval and obtuse. San Diego Canon, Sierra Madre Mts., Chihuahua Mexico, Lower Temperate Life Zone. This may be a form of S. Shepherdi with shorter glumes and smooth lemma.

Sporobolus capillipes var. delicatulus n. var.

This has elongated and capillary stems a foot or two long, weakly spreading. Internodes a half longer than the narrow sheaths. Leaves often 2 dm. long, not over 2 mm. wide, with thread–like tip. Panicle lanceolate and flexuous, mostly exserted on filiform peduncles and rather few–flowered. Glumes oblong–ovate, about $\frac{2}{3}$ the lemma. Soldier Canon Sierra Madre Mts. Chihuahua Mexico, Lower Temperate Life Zone, Sept. 1903

Sporobolus confusus var. aberrans n. var.

Glumes oblong, very long–hairy Lemma 1.5 mm. long, linear–elliptical, scabrous, sparingly hairy on the nerves. Bowie Arizona and Colonia Juarez Chihuahua Mexico, Lower Temperate Life Zone.

ARISTIDA.

In their treatment of this genus in Circ. 34 Div. Agrost. Scribner & Merrill make some errors. They speak of A. Americana as being a synonym of A. fasciculata Torr., and that it is a cæsp–itose and much–branched perennial. Whether it includes Torrey's actual type I cannot say, but it is not a cæspitose perennial but an annual and is not cæspitose but much–branched, in the fall, from the root and seeming cæspitose.

They keep A. purpurea distinct from A. longiseta because of being tuberculate on the lemma. All the forms in my herbarium, referred by them to longiseta are tuberculate on the lemma, some of them conspicuously so, especially the forms they refer to var. Fendleriana, most of these are scabrous and tuberculate, that is the tubercles end in short teeth at least on the upper part of the lemma.

A gracilis is an example of carelessness in citation, Vasey gives it as published on page 152 of Elliott's Sketchbook (Cont. Nat. Herb. 3 44.) The Kew Index gives it as page 141, when it was page 142. On the same page Vasey is made to say that the awns are 3–6 inches and 1–3 inches long, which makes one feel like hanging the average typesetter, for he never seems to think that the author of a book knows anything, and if he does not happen to

have the degree, minute and second type in his font he proceeds to butcher the text till the poor author goes crazy.

A. Jonesii Vasey is the var. fugitiva of A. Californica as is shown by the type in my herbarium.

Alopecurus Californicus, Piper in his Fl. Wash 110 says the anthers of A. saccatus are white and of the other orange. My own specimens from Pullman of A. Californica have both white and orange anthers in the same spike.

Sporobolus Nealleyi Vasey has some ludicrous citations. It was published in Torr. Bull. 15 49 1888, then in Cont. Nat. Herb. 1 57 1890, then in 3 62 1892. In the last he gives the first place of publication as Bot. Gaz. 16 48. Beal in Gr. 2 301 follows suit and the Kew Index does the same, only it goes one better by making it 15 49. Great are our tribulations when we get too lazy to look up our citations, and we all do it.

Eriocoma caduca (Beal) Rydberg is credited by Nelson in his Fl. 51 to Scribner, following Rydberg's similar blunder in Flora Mont. 25. It was first published in Beal Bot. Gaz. 15 111 as Oryzopsis.

Leptoloma Mrs. Chase in Biol. Soc. Wash. erects this genus from the Greek words "leptos" and "loma", the genus is therefore neuter and not feminine as she makes it.

Calamogrostis. This genus as revised by Kearney could hardly have been done much worse. It is full of intergrading so called species which are mere forms. The length of callus hairs and relative width of leaves are slim specific foundations.

Stipa pinetorum Jones is a peculiar form of Eriocoma Webberi.

Stipa spartea var. Tweedyi (Scribner).

S. Tweedyi Scribner Bull. Div. Agrost. 11 47.

Stipa Parishii var. depauperata n. var.

Stems about half a foot high, rigid. Leaves about 5 cm. long, involute, arcuate, acute, about 2 mm. wide when open. Ligule rudimentary. Panicle 5-7 cm. long, few-flowered, sub racemose. Glumes 10-12 mm. long, the upper a trifle the longer, very scabrous. Lemma about 5 mm. long, broadly linear. Awn about 1.5 cm. long, kinked in the middle. Detroit Utah, May 25 1891, Lower Temperate Life Zone.

Oryzopsis exigua var. Hendersoni (Vasey)

O. Hendersoni Vasey Cont. Nat. Herb. 1 267.

Sporobolus cryptandrus var. giganteus (Nash.)

S. giganteus Nash Torr. Bull. 25 88.

Eriochloa punctata var. aristata (Vasey).

E. aristata Vasey Torr. Bull. 13 229.

Muhlenbergia brevifolia (Nutt.).

Agrostis brevifolia Nutt. Gen. 1 44. Sporobolus cuspidatus Wood.

Muhlenbergia brevifolia var. Richardsonis (Trin.).

Vilfa Richardsonis Trin. Mem. Acad Pet. 5 2 103. V. depauperata Torr.

Muhlenbergia filiculmis (Thurber).

Vilfa filiculmis Thurber in Beal Gr. 2 288. M. Thurberi Rydberg.

Muhlenbergia Metcalfi n. sp.

Allied to M. parviglumis. Stem slender. Ligule elongated, lacerate, with thread-like tip. Leaves very acute, the root leaves about 1 dm. long, the several stem leaves 5-8 cm. long ,loosely involute, about 1 mm. wide. Sheaths close, a little shorter than the lower internodes, but longer above, with a light colored ring at the ligule. Panicle exserted, loose, linear. 1-2 dm. long, strict, acuminate. Rays in twos and threes, very delicate and capillary, bare on the lower fourth, then racemosely one to few flowered, the whole rarely 3 cm long, all closely appressed. Lateral spikelets on delicate pedicels rarely half as long as lemma, the many terminal spikelets on pedicles twice as long Glumes about equal, 2 mm long, narrowly oblong, purplish with hyaline margins. Lemma yellowish, linear lanceolate, nearly 4 mm. long, purple-ribbed above, with only a minute tuft of hairs at very base, abruptly contracted into a very delicate awn 5-8 mm. long. No. 1485 Metcalf, Santa Rita Mt Grant Co. New Mex., on rocky slopes at 7,000 ft. alt., Lower Temperate Life Zone probably.

The following two species have yellow or yellowish panicles. Awns not longer than the lemma. Upper glumes with short teeth on each side of the produced midrib, slightly awned. Annuals with simple stems.

Muhlenbergia Madrensis n. sp.

Stems weak, filiform, almost capillary, ascending, about 2 dm. long. Leaves thin, flat, about 1 mm. wide, 1-3 cm. long, obtuse, shorter than the somewhat enlarged sheaths which are rather loose and the upper ones inclined to have a few flowers inclosed, much shorter than the internodes. Ligule elongated. Panicle linear, about 5 cm long, few flowered, with florets closely appressed. Rays single, very short, 1-3-flowered, appressed, sometimes remote, the pedicels very short and with overlapping florets. Glumes about equal, the lower ovate and acuminate, the upper oblong and about half the lemma, light-yellow like the lemma, scabrous. Lemma linear, elliptical, obtuse, 2-toothed, scabrous, about 4 mm. long. In meadows, Round Valley near Garcia, Sierra Madre Mts. Chihuahua, No. 7315, Sept. 21 1903.

Muhlenbergia Diehlii n. sp.

Stems 2-3 ft. high, stout and a little branched at very base. Leaves several, 1 2 dm. long, about 4 mm. wide at base, quickly acuminate, acute, flat, thick. Ligule short. Panicle 1-1.5 ft. long, of very many single capillary and ascending rays 5-8 cm. long, the lower third without flowers, the rest of each ray with 10-20 florets closely appressed and racemose on pedicels about 1 mm. long. Glumes about $\frac{2}{3}$ the lemma, the lower lanceolate, the upper oblong, about equal. Lemma linear-elliptical, barely acute, scabrous, mostly with a purple blotch, 3 mm. long, yellowish like the glumes Awn a mere mucro or $\frac{1}{2}$ mm. long. This is allied to M. flavida Vasey. Guayanopa canon Sierra Madre Mts. Chihuahua Mexico, Lower Temperate Life Zone, Sept. 23 1903. No. 7316.

Agrostis filiculmis n. sp.

Stems tufted, erect, about 1 mm. thick, 2 ft. high, about 4-leaved, the internodes longer than the narrow sheaths. Ligule 2 mm. long and acuminate. Leaves about 1 dm. long and 1 mm. wide, appressed, the root leaves very short. Panicle about 5 cm. long, few flowered. Rays very unequal, capillary, flexuous, the longest rarely 2 cm. long, appressed, racemosely few-flowered above the middle. Pedicels similar, appressed, shorter than the spikelets. The glumes 2 mm long, acuminate-lanceolate, slightly unequal. aristate, nearly smooth except for a few short teeth on the nerves. Lemma about $\frac{3}{4}$ as long, very thin, oblong-ovate, acute, with a very slender awn attached at the middle and slightly exceeding the lemma tip. Plants very closely resembling Oryzopsis micrantha. Little De Motte Park on the Kaibab in northern Arizona, Upper Temperate Life Zone, on gravelly mesas, in the fall of 1894.

Bouteloua aristidoides var. Arizonica n. var.

Spikelets about 10-flowered, 2 cm. long Rachis not longer than the last floret. Tucson Arizona, Thornber, No. 177.

POA.

Because of the hopeless way in which the species of Poa are, by Vasey, Scribner, Rydberg and some others the writer has dreaded to take it up, but a proper regard for certain characters and ignoring trivial ones brings some order out of the chaos. though a person cannot untangle all the knots without visiting all localities at least twice with Poa particularly in mind. I have visited nearly every region exceqt the Saskatchewan, and most of them several times. I know the ecological condition under which these plants grow. I make the following changes and suggestions.

Foa Fendleriana var. arida (Vasey).

Poa arida Vasey Cont. Nat. Herb 1 270. This is very abundant and variable and includes P longiligu a S. & W., P prate ricola Rydberg, P. Sheldonii Vasey. The species often grows in large tufts and so the outer stems seem stoloniferous.

Poa Fendleriana var. spicata (Vasey) Scr. is P Andina vars. spicata, purpurea and most of elongata Vasey.

Peo Fendleriana var. juncifolia (Scribner).

Poa juncifolia Scribner Bull. Div. Agrost. 11 52. This is a small and rigid form growing in specially poor and alkaline soil.

Poa purpurascens var. epilis (Scribner).

Poa epilis Scribner Circ. Div. Ag. 9 5. This is a common mountain form at the north and passes into the species at all points.

Poa filifolia Vasay is P. Idahoensis Beal, P. scabrifolia Heller, P. Spillmani Piper and P. nematophylla Rydberg.

Poa Wheeleri Vasey is P tricholepis and subreflexa Rydberg, and I can see no good character to keep Olneyæ Piper separate. It is very variable The original is an abnormal starved form not hard to match.

Poa nervosa (Hook.) Vasey is P. flexuosa var. occidentalis Vasey. P Eatoni Watson, P. Vaseyana Scribner and P. curta Ryd

Poa gracillima Vasey is P. saxatilis S. & W. and little more than a well marked form of P. glauca.

Poa gracillima var. Vaseyochloa (Scribner).

Poa Vaseyochloa Scribner Circ. Div. Ag. 9 1, a substitute name for P pulchella Vasey.

Melica argentea (Howell).

Poa argentea Howell Torr. Bull 15 11.

Poa Buckleyana var. elongata (Vasey), P. Andina var. elongata Vasey. This is a slender and few-flowered variety.

Poa Buckleyana var. stenophylla (Vasey).

Atropis tenuifolia var. stenophylla Vasey in Beal Gr. 2 580.

Poa Buckleyana var. Sandbergii (Vasey).

Poa Sandbergii Vasey Cont. Nat. Herb. 1 276. This is P. incurva S & W.

Poa Nevadensis var. Leckenbyi (Scribner).

P. Leckenbyi Scribner Circ. Div. Ag. 9 2.

Poa Nevadensis var. lævigata (Scribner).

P. lævigata Scribner Bull. Div. Ag. 5 51. P. lævis Vasey, P. Wyomingensis Scribner, P confusa Rydberg.

Poa glauca var. strictior (Gray).

P. cæsia var. strictior Gray Man. Ed. 5 631.

Poa glauca var. crocata (Mx.).

P. crocata Mx. Fl. 1 68.

Poa Bolanderi var. Kelloggii (Vasey).

P. Kelloggii Vasey Gr. Pac. 3 79.

Poa Bolanderi var. Howellii (V. & S.).

P. Howellii V. & S. Gr. Pac. 2 78.

Poa occidentalis Vasey is the same as P. platyphylla Rydberg.

Poa leptocoma var. reflexa (V. & S.).

P. reflexa V. & S. Cont. Nat Herb. 1 276.

Poa laxa Hænke is P. alpicola Nash. The eastern plant which may be called var. debilior n. var, is laxer, with pale spikelets, and acuminate leaves, our western plants are the same as the Europæan ones.

Poa pratensis var. pseudopratensis (Scr. & Rydb.).

P. pseudopratensis Scr.& Rydb. Cont. Nat. Herb. 3 539.

Eatonia. The writer objects to the relegation of this genus to synonymy. On the showing of Scribner in Rhodora 8 137 ff. there is no reason at all for the creation of Sphenopholis by Scribner. The Eatonia of Rafinesque was apparently a Panicum and therefore a synonym. At any rate no specimens of it are extant and it should be treated as a nomen nudum. This leaves us the Eatonia of Endlicher, which is clearly defined and has been accepted as a genus for eighty years and as the proper name for the species. The "once a synonym always a synonym" dictum is the the only basis on which it rests and this foolish idea never had any conservative support. The writer holds that the merging of certain species of Trisetum with it is not sound, for it confuses both genera. Trisetum is well characterized by the split lemma with the two acuminate teeth hyaline, and the midrib produced either in the notch or below it into a conspicuous awn. In the normal Triseta the upper glume is wider below, but in the Eatonioid species T. Hallii, interrupta, palustris and filiformis (Eatonia Pennsylvanica var. filiformis Chapman Fl. S. States 560) the upper glume is larger above, and in the last species the hyaline teeth are small. Eatonia is well characterized by the entire lemma truncate or rounded at tip and awnless, and by the upper glume always larger above The spcies are two, or at the most three: E. obtusata, nitida and pallens.

Panicularia. This genus was founded by Fabricius Enum. Pl. Hort. Helm. 373 1763 and has been taken up by the Brittonians to replace the Glyceria of Robert Brown. One of the fundamental points insisted on by them (which I believe is sound and which the botanical world has accepted tacitly in practice for over

a century) was that a genus was not properly founded unless species were given with it, and on this basis alone they still persistently refer Linnæan genera to the Species Plantarum where no genera were described but had been previously. On this basis Panicularia has no standing, but with a Brittonian such a trifling thing as consistency must not interfere when there is a rich pay streak of new names in sight. It has been a time-honored custom, which is only another way for showing the mature and unbiased judgment of several generations of botanists, to ignore old genera not accompanied by species unless they were taken up later by otherrs, and in the latter case the genus was duly credited to its first describer, which is just. For example an extreme case is Calamagrostis which was first published by Adanson (since Linnæan time) who credited it to Dioscorides, but species were first made by Gmelin. So the proper credit for the genus is Calamagrostis Dioscorides in Adanson Fam. and Gmelin Syst., and not Calamagrostis Gmelin as the unjust Brittonian system would have it. In the case of Panicularia the genus was ignored and no species ever published in it till the evangel of the Brittonian hair splitters appeared in Otto Kuntze in 1898, who like them, cared more for a little notoriety than the good of botany, and renamed all the species of Glyceria as Panicularia, though Glyceria was the first genus to have species described in it, and was published in 1810. It therefore seems right for Hitchcock to retain Glyceria in the new Gray's Manual.

WASATCHIA.

Wasatchia Kingii (Watson).

Poa Kingii Watson Bot. King's Exp. 387, Festuca confinis Vasey. This genus has been relegated to Festuca where it is a worse misfit than in Poa. Watson as a field botanist recognized its similar habit to that of Poa Fendleriana and glumaris. Some Poas are diœcious occasionally or at least sterile, this is always diœcious a feature not recognized before so far as I remember, and it differs from Poa conspicuously in the coarse and rigid leaves and in the texture, in the thick and woody root, and in forming large ring-like tufts often 6 feet in diameter from its creeping rootstocks. Its spikelets are more like those of Melica than any, particularly the fertile ones. But its nearest relative is certainly Distichlis. It is not related to Festuca. Distichlis is now the receptacle of some odds and ends such as Eragrostis obtusifolia and Poa Texana, but it seems like stretching the genus too much. Our plant is quite

different in habit from Distichlis as it never grows on flat nor alkaline soil, but on high slopes in sweet soil from the oak zone to the edge of the alpine. Comparing it with Poa glumaris its stems are densely aggregated at the outer edges of the tufts but connected by stout and rigid rootstocks which are very short between the stems, unlike Poa glumaris The leaves are flat and coarse and the ligule a short and hyaline band as in glumaris. but the leaf ribs are sharp and not rounded as in the other. The spikelets are in a linear not oblong panicle and more closely appressed. The The rays are twin, one of them often branching just above the base, conspicuously flattened, not angled as in the other, straight and not flexuous as in the other which also has the rays in threes or multiples. At the insertion of the rays is a yellow callus surrounding the rachis which is winged but smooth on the lower nodes, each joint or branch has a similar callus at base and tip of pedicel. In P. glumaris the callus does not go across except at very base and is hairy. The spikelets are perfect in glumaris and always diœcious in Kingii, much flattened in both: 5-7 flowered or rarely less in glumaris and oblong, normally 3-flowered and rarely 5-flowered, normally lanceolate and rarely ovate in Kingii. The rachilla in glumaris is flexuous. conspicuous and hairy; in the other straight, smooth and visible only on dissection and thus spikelet becomes ovate when 5-flowered. The glumes in glumaris are thin like the lemma but not differing above, narrowly elliptical, hardly acute, 3-nerved and keeled to the tip. about smooth and about as long as lemma; in Kingii they are conspicuously translucent and hyaline except at very base, acuminate and very acute, ovate to narrowly lanceolate, from $\frac{1}{2}$-$\frac{2}{3}$ the lemma. about smooth, slightly one to several-nerved at very base and not keeled, terminated below with a short ring-like callus as in Bromus, Festuca, etc. The lemma of glumaris is lanceolate, acute, thin, keeled to near the tip, strongly 3-5 nerved and sulcate between the nerves, occasionally with a few faint intermediate nerves. strongly scabrous-puberulent above and conspicuously long-hairy at base: the lemma of Kingii is similar in shape mostly, very acute and thin, with flat areas between the equally raised ribs. variably 5-7-nerved, often with 3 additional nerves between the main ones and so making 15-21 nerves in all, rounded on the back, scabrous-puberulent and equally so all over to nearly smooth, not hairy, notched and eared at tip like Bromus, and with midrib produced as a sharp point or minute awn.

Comparing Wasatchia with Distichlis the same can be said of its habit of growth as differing from Poa glumaris. The leaves

of Distichlis are distichous, folded, long-acuminate, very rigid, pungent, divaricate, rarely over 2 mm. wide; those of Kingii are not distichous, shortly-acute, flat and often 1 cm. wide, ascending. The ligule of Distichlis is a ring of hairs; of Kingii a flat and hyaline band. The rays of Distichlis come out singly and branch racemosely and without any special callus at the nodes, are flat and very scabrous, the spikelets are much flatter, the glumes and lemma similar to eachother, coriaceous, rounded, not sulcate, the nerves are rather many and about equal, vanishing below and at very tip and scarcely at all raised, the shape about ovate and very different from Kingii. The spikelets are generally many-flowered.
☞ On May 19 pp. 1-16 of these Contributions had been printed and on this date I received the May Bulletin containing Rydberg's Hesperochloa (Piper) which therefore antedates Wasatchia by a few days, though my MS. and critical work preceded his publication many months. Rydberg in this follows his usual course of copying the work of others without critical study of his own, a subgenus by anyone is off hand a good enough genus for him, and so forthwith he erects the new genus and in this exceptional case it will stand. The sum total to the previously published facts on it are that it is diœcious, the stigma is extra plumose (a character common to Distichlis and many Poas), and that the stems are "occasionally stoloniferous" ! I should say so !

AGROPYRON.

This genus, in the light of today, was bunglingly treated by Scribner and Smith in their revision, Bull. 4 Div. Ag. They failed in synonymy, their keys were poor, and their conception of specific limitation bad from lack of field work. Out of the four new species proposed not one is valid, while one variety may be a good species, A. caninum var. andinum which is based on my No. 720 from Colorado. This is either a sport, hybrid between violaceum and caninum, or a valid species. My material appears abnormal, like a sport due to some diseased condition.

Agropyron caninum var. Richardsoni (Trin.) n. n.
Triticum Richardsoni Trin. Linnæa 12 467.

A. spicatum S. & S. is A. Smithii Rydberg. To this must be reduced the following:

Agropyron Smithii var. Palmeri (S. & S.) n. n.
A. spicatum var. Palmeri S. & S. Rev. Agropyron 33.

Agropyron Smithii var. molle (S. & S.) n. n.
A. spicatum var molle S. & S. Rev. Agropyron 33.

Agropyron Smithii var. riparium (S. & S.) n. n.
A. riparium S. & S. Rev. Agropyron 33. This is a variety with very short glumes.

A albicans S. & S is almost certainly an awned form of A. dasystachyum.

A. spicatum (Pursh) Rydberg must include the following: (Piper Fl. Wash. 146 credits this to S & S. l. c 33 erroneously, the plant they describe is A occidentale Scr. which is A Smithii Rydberg. It is true at the close they state it is Festuca spicata Pursh but their description differs and must take precedence. The proper citation is A. spicatum (Pursh) Rydberg Fl. Mont 63.)

Agropyron spicatum var. Arizonicum (S. & S. Rev. Agropyron 27 as species) n. var. This includes A. Parisii S. & S.

Agropyron spicatum var Pringlei (S. & S. l. c. 31 as A. Gmelini var.). I have a complete line of intergrades between all these forms.

Agropyron tenerum var. pseudorepens (S. & S. l. c. 34 as species).

A. tenerum, as Hitchcock has shown, includes pseudorepens, but this is a well marked form growing in alkaline places. The original A. tenerum, of which I have ample material, was undoubtedly material of the second year from seed started in the fall (Vasey describes it as a seemingly annual) growing in sweet and good soil where it almost never stools, or the rootstocks are very short or hardly noticcable. In alkaline soil it stools out and produces copious runners. This is the tendency with most grasses, though we would expect the reverse as the effect of salts on vegetative processes.

A. Scribneri is an Elymus of the Sitanion group.

Bromus eximius (Shear) Piper Fl. Wash. 143 exhibits the beauty of the botanical bunco game attempted to be worked on botanists by the Britton an system which the world botanists have rejected. The system, like the Irishman's turtle with its head cut off and still wriggling its tail is dead but the tail portion in the person of the man who forced it on the Department of Agriculture is not sensible of it and compels better men to use it in publications of his Division. It is the belief of some geologists that the Silurian age was not contemporaneous throughout the world and some things in the Department of Agriculture squint that way, but the writer believes it is a case of arrested development. Shear described B. vularis and refers it to B. purgans var. vulgaris Hooker. Piper concludes that it is different and because of the previous varietal name changes it and all its varieties. To make it

worse Piper overlooked the earlier B. ciliatus var. ligulatus which his Brittonian system will compel him to adopt along with a new set of names. The whole system has become an intolerable nuisance, and yet this is not the worst part of it.

SITANION.

A study of the genus in the light of Smith's revision shows that it cannot be maintained for it passes directly into Elymus at all points.

Elymus Scribneri (Vasey).

Agropyron scribneri Vasey Torr. Bull 10 128.
Elymus Saundersii includes Sitanion planifolium and lanceolatum.

Elymus brevifolius (Smith).

Sitanion brevifolium Smith Rev. Sit. 17. This includes S. Leckenbyi, longifolium and pubiflorum.

Elymus insularis (Smith).

Sitanion insulare Smith l. c. 14.

Elymus Hystrix (Nutt.).

Ægilops Hystrix Nutt. Gen. 1 86. This includes S. elymoides, molle, cinereum, strigosum, cæspitosum, montanum and Brodiei.

Elymus minor (Smith Rev. Sit. l. c. 12 as Sitanion).

Elymus multisetus (Smith).

Sitanion multisetum Smith Rev. Sit. l. c. 11. This includes S. jubatum and villosum.

Elymus ambiguus includes E. salinus Jones, E. simplex S. & W. and E. aristatus Merrill.

Panicum Urvilleanum occurs from Kelso in the Amargosa desert south and west, California. Hitchcock & Chase do not record it within a long distance from there.

Carex fissuricola Mackenzie. Mackenzie goes directly against the facts in making this new name for C. ablata Bailey. Bailey in Proc. Am. Acad. 22 92 gives frigida as found by Watson (see Bot. King's Exp.) in Cottonwood Canon Utah, also says it may be C. luzulæfolia, then in Bot. Gaz 13 92 he describes it and quotes Watson's plant as the first of the type specimens, my own copious material has been widely distributed. In Coulter's Manual 380 published earlier he describes the species fully, based on the Utah specimens and under the head of C. frigida. It therefore is certain that the Utah material is the basis of C. ablata, and on this C. fiissurata is founded and by altering Bailey's characters in sev-

eral important particulars. It is comical to see how the mere name of Bailey sets the Bronx menagerie in a rage, and all because he was the first man to dare to attack the Brittonian system. They jump on him like wild cattle of the Plains on the hair of a dead coyote. It might be a good idea for our Bronx friends to get shod as they have quite a job ahead of them killing off all such enemies, or they might be as badly off as the Kilkenny cats, nothing but the tails left.

Scirpus Clementis n. sp.

Allied to S. cæspitosus. Stems densely matted like Carex filifolia, deeply sulcate, 2-3 inches high. erect and strict, leafless. Leaves thick, fiilform, 2-grooved above and deeply grooved below, very blunt with a rounded callus. Head terminal, about 2-flowered, subtended by a colored and leaf-like bract 3-4 times as long. Scales elliptical, obtuse, about 3 mm. long, tawny. Akene about 2 mm. long, obovate and triquetrous, with 3 long filaments and no bristles, papillate, with a minute mucro at the almost truncate tip. Rae Lake, King's River, California, alpine, July 20 1910, Mrs. Clemens.

LILIACEÆ.

ZYGADENUS. In speaking of the poisonous effects of this genus Piper, in Fl. Wash. 198, casts doubt on the fact and intimating that it is a fiction. One cannot be too careful in discounting common experience as the baneful effects are accentuated by supposedly correct scientific publications like this, causing deaths. In 1894 I was (in their estimation) "floored" by C. Hart Merriam and others of the Biological Survey by the specious argument that the Gila monster could not be poisonous because it had no poison fangs, while I had records of deaths by it. Now its poisonous nature is admitted in spite of absence of fangs.

In the case of the poison sego (Z. paniculatus probably) there are several well authenticated cases of deaths within 24 hours by people eating the roots. The deaths all ended in convulsions like Veratrum poisoning. Years ago I sent a quantity of the bulbs to Washington for analysis, but for "lack of material" the test was not carried beyond determining that they contained an alkaloid which "probably was the poisonous principle". We know that Veratrum contains several poisonous alkaloids and is a close relative. Prof. Orson Howard (formerly Prof. of botany in our state univerity) was out on the hills, with a companion digging and eating sego (Calochortus Watsoni) bulbs, when they happened to find a par-

ticularly large one they drew "cuts" to see who should have it. The other boy got it, ate it and became sick and died that night. Several similar cases gave it the name of "poison sego". There is no other poisonous bulb in Utah but the two species of Zygadenus that could have caused the trouble, and Z. venenosus is out of the question because it grows only in meadows with us, though farther north where the humidity is greater it has the habit of the other. Piper refers to Z. venenosus, but none but a botanist can tell them apart.

In Torr. Bull. 30 272 Rydberg, in his usual careless way, attempts to segregate sections of this genus into three genera and without any acknowledgment of the fact that these distinctions were known before he was born. He makes Toxicoscordion differ from Zygadenus proper (which he confines to Z. glaberrimus) in having a tunicated bulb instead of an elongated rootstock, in having a free and not adnate corolla, and in having a single obovate to half-round gland. Anticlea he separates on the V-shaped gland and adnate ovary, it also has the tunicated bulb of Toxicoscordion. Now an examination of the genus shows that its species fall naturally into two rather well defined groups (shading into eachother), the large and white-flowered (often with a tinge of blue) forms with twin or V-shaped single gland which is morphologically a union of two glands at the lower edges, and the small yellow-flowered forms with a single obovate to oblong gland. The white-flowered forms all have a rootstock, but it is elongated only in Z. glaberrimus. The yellow-flowered forms are without a rootstock or a mere rudiment. Rydberg ignores these manifest facts and unites Z. Fremontii with the yellow flowered forms because it has a free ovary, that is, because the corolla segments are split to the base as is the case with the others. A critical examination of the gland of Z. Fremontii shows that it belongs with the V-shaped class although the gland is usually so imperfect that it is a mere greenish band around the top of the claw, but whenever it is developed at all there are two centers, one on each side of the midrib, where it is the most pronounced. The claws of the yellow-flowered forms are so narrow that there is no room for two well defined glands and thus are crowded together till the lower edges coalesce on the inner margins, and because they are set obliquely, they form the V-shaped compound gland. In the small flowered forms of the white-flowered group we finb the gland often obscure in Greene's Z. porrifolius (which is the same as Z. virescens and only an extreme form of Z. elegans). The small flowered forms of Z. Fremontii have a yellowish shade to the flowers, and Z. chloran-

thus (unknown to me) seems to have the same character. Another character that shows the folly of separating the species of this genus is in the pod which in the elegans class is ovate-acuminate and long-styled, while in Fremontii and the yellow-flowered forms it is oblong and nearly truncate at tip with very short styles. The leaves of the white-flowered forms are naturally glaucous and light-colored, flat above, and normally broad though narrow, in small forms. The leaves of the yellow-flowered class are a peculiar yellowish-green, always narrow and triquetrous or channeled in or near the tip. The bulbs of the white-flowered class are shallow, that is near the surface, the others deep in the ground Rydberg's Z. intermedius, acutus and gramineus are forms of venenosus, and falcatus is a form of paniculatus, all these he puts in Toxicoscordion. Anticlea Coloradoensis is the high altitude form of Z. elegans and is the same as Blankenship's Z. alpinus. Z porrifolius Greene which has been distributed by Wooton both as Mexicanus and porrifolius (both named by Greene) is as I have said an extreme form of elegans, just as my Z. Fremotii var. brevibracteatus is an extreme form of that species, Miss Eastwood's Z. micranthus is the same and her Z. exaltatus a large form of Fremontii. Z. longus Greene is a green-flowered form (a common state also in Veratrum) and is the same as one of my specimens from A. Nelson marked "Z. dilatatus Greene". Z. chloranthus I do not know, but it cannot be maintained on the characters given by Robinson and Fernald in the Manual as distinct from elegans of which I have plent of material from near Pursh's type locality as well as elsewhere. Z. Mexicanus (Townsend & Baker, named by Robinson) is the same porrifolius form of elegans and corresponds with other material from Black Mt. N. M. (Wooton as elegans) and from the Mogollons (Wooton as Mexicanus).

In the May Bulletin Rydberg indulges in some puerile pettifogging to escape, but cannot answer, my criticisms. In Contributions 12 77 I attacked his work showing the inaccuracy of his description of Z. intermedius of which my No. 2091 is one of the 7 types on which he founded the species. In answer he says that the first specimen was the type "and therefore he is not more accurate than I". Rydberg evidently does not know the difference between a type specimen and a type. If with material from six other localities before him he deliberately ignored them and founded his species on the one Sandberg specimen the botanical world will not seek to find the cause of his poor work. Everyone else knows that all material passed under review is a part of the type unless differing enough to be noted by the author.

It is a matter of no importane to the botanical world whether one or the other of us is "the more accurate", it is after the facts and wants the problems of systematic botany settled, not befogged, and that too in the full light of genetic relationship, ecology and geological history, and not in the line of the number of bugholes in the leaves or the rulings of a metropolitan inspirational autocrat.

Dasylirion Zucc. is not properly derived. It is from the Greek dasus and leirion, and therefore should be Dasyleirion. This brings the pronunciation in line with the Greek.

STENANTHIUM and STENANTHELLA. Rydberg in Torr. Bull. 27 530 attempts to make a new genus of Stenanthium, calling it Stenanthella. His characters for it are: superior ovary, perfect flowers campanulate and with conspicuously reflexed lobes, and different habit. How a person can blunder so and with specimens before him and supposedly a little field work is hard to see. For Stenanthium he gives: ovary partly inferior, polygamous flowers not campanulate and without reflexed tips. Stenanthium occidentale (which he puts in Stenanthella) is polygamous, I have ample material gathered and studied by me, in the field in all stages. The fully mature pod is 4-6 mm. long and adnate as he would find if he took the trouble to dissect the so-called obconical stipe. The pod appears lanceolate but is really fusiform with the cavity extending to the base. The flowers are campanulate and with reflexed tips. This species is pratically his type of Stenanthella. By referring to Britton's Flora 1 403-4 we find both species of Stenanthium figured as having campanulate flowers with reflexed tips. In S. occidentale the segments form a narrower flower than in either of the other species, but that is all. The only characters on which he could possibly found his genus he omits: the drooping flowers in simple not compound racemes, and leaves normally lanceolate and acuminate at both ends, but these are not good generic characters. Another peculiar feature of S. occidentale is that the segments are not only "withering persistent" as in many other Liliaceæ but enlarge or elongate with age becoming green and remaining so till the pods mature. The segments retain their real shape but a day and then the margins inroll. The erect part of the segments which form the bell part of the flower is broadly oblong and with hyaline margins, it then narrows abruptly to the broadly lanceolate to long-linear and thick tip which in flower is reflexed and is erect in fruit and green, in the sterile flowers they are light-colored, hyaline and do not elongate, the fertile ones are dark-purple or a lurid-green. The leaves are generally conspicu-

ously long-acuminate at both ends, often an inch wide in the middle but at other times are 3-4 mm. wide and only a trifle wider in the middle but as long as the others. The plant is high alpine, growing just on the edge of stunted tree belts along gulches filled till late with snow.

VERATRUM. An examination of all the species of Veratrum after many years field study and note taking on the ground leads one to reject the work of Heller and Rydberg as untenable because it is founded on trivial and evanescent characters of no worth. Heller bases V. Eschscholtzianum on the drooping panicle branches, when eastern forms (V. viride) are often drooping and western forms often erect. Western forms are described by him as having bracts as long as or longer than the flowers, when in fact they are more often shorter, some of my material have bracts hardly longer than the pedicels. V. Californicum Heller tries to disintegrate, he separates V. speciosum, giving it acute petals and a V-shaped mark at base, when in fact every gradation can be found on the same plant. He separates out V. Jonesii on my material gathered for the fruit (from Idaho) on the basis of a single specimen (seen by him) collected after the petals had shrunk by maturing and partly drying before I gathered them and so had become half their normal length. The rest of this material got at the same time and place has petals from wholly dried to fresh on the same plant (before gathering) varying from 5-8 mm. long and from oval to almost linear and the V-shaped mark from very evident to nothing at all. Naturally one would expect a botanist to know by the maturity of a specimen why it was collected but if we are to the thinking for the closet botanist to prevent fake species he will have to go out of business or we shall have to label our material "gathered for the fruit, petals shrunk to half by partly drying in the air, closet botanist nota bene, see this ☞", and then if they do not pay any more attention than they usually do to collectors notes will we be guilty under the law of contributory negligence? V. tenuipetalum Heller founds on linear petals and lax and open inflorescence more like that of V. viride. I have similar material from its range, the south, New Mexico, Arizona and the Sierra Madres with the same lax habit and elongated petals often 4 mm. wide and not linear. V. caudatum Heller founds on a common form with elongated panicle axis and narrow petals. This is frequent from Salt Lake City northward and as often has oval as linear ones and varying greatly in length. The tail of the panicle varies from 1-2 ft. long to nothing at all. One would hardly expect a botanist to be ignorant of the fact that plants in rich soil or with an excess of water will run to leaves and bracts and and

many flowers, the great abundance of the latter making them smaller, and excess of sunlight reducing the size of parts and narrowing the petals. Such elemental facts should hardly need to be stated but it seems that some of our College men have yet to discover them. The time was that after securing their Ph. Ds. we gave our young men their final polish by a few years in Germany, but now we shall have to do it in the kindergarten —or the woodshed.

The petals of Veratrum are described as sessile, but all have a short and thick claw, those of Californicum are often lacerate on the upper margins, the flowers are rotate to campanulate, the basal nerves are impressed, the stamens have recurved tips, and all species have the base of filaments deltoid-enlarged.

CALOCHORTUS. After a generation of field work there are several species I do not yet know well, bnt I omit most of these. I offer the scheme below as a more natural arrangement.

Calochortus Watsoni n. sp.

I propose Calochortus Watsoni for the plant generally known as C. Nuttallii T. & G., but not the plant described by them in Pac. R. R. I 124. That plant is C. Leichtlinii Hooker and Nuttallii var subalpinus Jones, it is the only species like it growing in the high Sierras and is at once separable by the sagittate anthers. The amount of divergence and length of the lobes vary, but never is absent. C. Watsoni is the plant of Watson in King's Report as to specimens collected under the name of Nuttallii, is the plant described in Coulter's manuals, etc, but for convenience I designate all material distributed by me under Nuttallii as the types, except the varieties. Watsoni is rarely less than 2 ft. high, the other rarely more than 1 ft.; Watsoni has stem leaves and bracts broad at base and abruptly contracted into a long filiform tail, the other has leaves tapering gradually from base; the anthers of both are strongly ribbed as in Gunnisoni; the petals of both are similar but the gland of Nuttallii is oblong and not bee-hive-shaped as in the other and the petals are normally with a large ovate purple eye near the middle, while in Watsoni they have a reversed V-shaped eye low down or a crescent a little way above the gland; the pods of Nuttallii are mostly broadly lanceolate and shortly acuminate and much shorter than the linear and long-acuminate ones of Watsoni, the latter abonuds from the dry juniper mesas of New Mexico through southern Utah to the foot of the Sierras and northward, never alpine and rarely growing far up in the Middle Temperate Life Zone, very rare in Montana (if found there at all) and Idaho. Most of the plants of the north referred here are large

forms of C. nitidus which is not bulbiferous at basal leaf, more slender and at once separable by the ribless anthers.

Calochortus Watsoni var. ambiguus n. var.

Stems about 2 dm. long; flowers purple; gland often below the filament tip and broad and about round; anthers mostly longer than the filaments. This much resembles C. flexuosus but the filaments are yellow and the anthers mostly purple, and the base of petals yellow as well as gland except a narrow purple crescent above the gland. The stems are only slightly flexuous and nearly erect. The ribbed anthers at once separate it from flexuosus. This abounds throughout the Navajo Basin and south to the Pinals in Arizona. Lower Temperate Life Zone.

Calochortus acuminatus Rydberg is C. macrocarpus as to original description and figure. In his Fl. Col he refers forms of C. Watsoni to it.

Calochortus speciosus n. sp.

I propose this name for the most remarkable species in the genus not because I think it is new but because no one seems to know what C. Kennedyi is. If Watson's description of that species was right then this is new, but he was often inaccurate in the revision of the genus. Stems rarely 2 dm long, mostly stout and short, not bulbiferous, erect, somewhat flexuous and with short internodes and several rather rigid and falcate leaves, the root leaf greatly elongated and the stem leaves much shorter and with broad bases hyaline-margined, the coarse bracts similar and 2-8 cm. long but broader below. Flowers mostly 2 and terminal, on short peduncles rarely 5 cm. long and enlarging upwards. Buds about 2 cm. long and 1 cm. wide, ovate. Sepals about ovate and apiculate, nearly olive-colored, with broad hyaline margins, about 2 cm. long. Petals when fresh brilliant brick-red, fan-shaped, 3-5 cm. long, erose, the lower $\frac{1}{3}$ nearly black with a large laciniate-edged blotch, the very base yellow. Gland very small or obscure, roundish, with very short hairs, mostly nearly black. Hairs of petal on black part few, long, club-shaped. Anthers tapering toward tip, linear, obtuse, purplish, about 1 cm. long, on very short deltoid and yellow filaments about $\frac{1}{4}$ as long. Style slender, about twice as long as the large stigma is broad. Pods acuminate, linear-lanceolate, 2-3 cm. long, deeply lobed. The sepals and petals usually are colored through near base with splotches of purple Flowers often 6 cm. wide. Frequent from Chloride Arizona to Congress Junction at least, westward through Kelso to the Argus Mts. California, among junipers on dry slopes, in very poor soil, Lower Temperate Life Zone.

Systematic Arrangement.

A. Pods acuminate, narrow, wingless, mostly erect. Glands mostly scaleless.
AB. Only the lowest leaf with a bulblet. Pods and flowers erect.
ABC. Flowers yellow or red.
Flowers yellow. C. Weedii, luteus, clavatus, aureus, venustulus?
Flowers brick-red. C. Kennedyi, speciosus.
AB2C. Flowers neither yellow nor red.
AB2CD. Anthers flat, 2-3-ribbed.
AB2CDE. Gland not wider than long.
Gland without scale-like border. C. striatus, Palmeri, splendens (excavatus and invenustus are synonyms), Plummeræ, Catalinæ, venustus.
Gland with scale-like border. Anthers acuminate, but obtuse. C. macrocarpus (acuminatus a synonym).
AB2CD2E. Gland broader than long. Stems mostly prostrate and contorted. C. flexuosus.
AB2C2D. Anthers 5-7-ribbed.
Anthers obtuse.
Anthers sagittate. C. Nuttallii.
Anthers not sagittate. C. Watsoni.
Anthers acuminate and tailed. C Gunnisoni.
A2B. Most of the leaves with bulblets in the axils.
A2BC. Pods erect.
Flowers yellow. C. veustulus?
Flowers purple. C. Ghiesbrechtii, exilis, spatulatus, purpureus.
Flowers nearly black. C. Pringlei.
A2B2C. Pods and flowers nodding.
Stem leaves not enlarged below. C. barbatus.
Stem leaves enlarged below.
Petals smooth. C. grandiflorus
Petals hairy. C. Hartwegi, cernuus.
2A. Pods winged, broad and obtuse, often nodding. Gland mostly transverse and lunate. Leaves flat and mostly broad.
2AB. Pods and flowers erect. Flowers white to purplish. Gland scaleless.
Gland longer than wide. Flowers large. Anthers long. C. Lyoni, nitidus, Greenei
Gland wider than long. Flowers small. Anthers short. C. lougebarbatus.
2A2B. Pods and flowers pendent.

2.\2BC. Gland scaleless.
Flowers yellow. C. apiculatus, Howellii.
Flowers not yellow. C. Tolmiei.
2A?B2C Gland covered by a scale which is often lacerate.
Anthers obtuse, not acuminate.
Flowers bell-shaped. C. nanus, lilacinus, uniflorus.
Flowers globose. C albus, pulchellus.
Anthers acute and acuminate.
Flowers yellow. C. Benthami
Flowers cream-colored. C. Purdyi
Flowers rather purplish, neither yellow uor cream-colored
Petals broader above, mostly rounded C. Maweanus, cæruleus, elegans.
Petals broader below, acute. C. Lyallii.

Though I have considerable material from near the sea I have done little field work on the species and my opinion is no better than that of a closet botanist (which is seldom worth much), and so is only tentative, but I have studied nearly every other species in the field.

Schœnocaulon Megarrhiza n. sp.

Stems from a thick, erect, coarse bulb 3-5 cm wide and about 1 dm. long which is truncate at both ends and thickly covered with coarse fibers Leaves 2-3 ft. long, flat slightly narrower below only, coarsely and very strongly 13-ribbed, the widest about 8 mm. wide and tapering to a long and thread-like tip, glaucous-yellowish-green, Nolina-like, smooth bnt with minutely scabrous edges, lax Stems 2 3 ft. high, nearly round, strict, 2-3 mm. wide, ending in a simple spike-like and rather dense raceme which is 1-1.5 ft. long. Floral bracts very broad, about 2 mm. long, dull, hyaline. Pedicels about 1 mm. long, very stout, ascending, not jointed Flowers greenish, about 3 mm. broad, the base broadly bell-shaped to hemispherical and about 1.5 mm. long, segments nearly 3 mm. long, the broad and green midrib extended as a tail beyond the cuneate to rhomboidal lower half or third which has its sides produced as hyaline wings or ears rather deltoid in shape. Stamens about $\frac{1}{4}$ longer than the corolla, with relatively enormous anthers about $\frac{1}{4}$ as long. Ovary ovate, with mostly twisted tip, becoming a lanceolate and rather glaucous erect and 3-angled pod. Styles 3, thick, tapering, a little recurved, stigmatic on the inner face at tip. Guayanopa Canon Sierra Madre Mts. Chihuahna Mexico, Sept. 23 1903. Lower Temperate Life Zone.

Camassia Leichtlinii var. Watsoni n. var.

Quamasia Quamash (Pursh) Coville. An examination of a large amount of material coupled with much field work shows that this is not distinct from C. Leichtlinii. The senseless name of Coville I reject for evident reasons. It seems to have escaped the notice of Watson and others that the petals are 3-nerved and the sepals 4-7-nerved, or at times even more. The species Cusickii, Howellii, and Suksdorfii probably can hold but are very weak.

ORCHIDACEÆ.

Gyrostachys is credited to Persoon's Synopsis 2 511 by the Kew Index, and by Britton Fl. 4 470. It seems that the first one to copy this blunder was Kuntze, then MacMillan, then Britton and Rydberg tagged along behind, all too careless to look it up. The modest way in which they forget to remember to call our attention to their fake names so made is in vivid contrast with the noisy way Rydberg calls our attention to Ames's blunder on Serapias, in a recent Bulletin. It would seem that the making of a lot of fake names because certain people were too lazy to look up a reference right at hand was an inadvertance not worth mentioning, while for Ames to make a new name or so after long research because he failed to find an obscure reference that nobody knew anything about (and Rydberg found only accidentally) was little short of a botanical crime. What a difference it makes whether one holds a ten cent piece right over the eye or puts it a mile away as to its apparent size.

Dumort seems to have been the first to publish a Gyrostachys, in Fl. Belg. 1827, nine years after Spiranthes Richard, and fifteen after Ibidium Salisb.

Habenaria. In checking up Rydberg's work on this genus and in the light of Krænzlin's revision it became necessary to go over most of his proposed species and genera. I see no evidence of care or thoroughness, or the unearthing of new facts. His new genera are based not on discoveries, but on characters known before he was born. His species are largely descriptions of individual plants and showing little capacity for generalization. In Torr. Bull. 28 611-2 he calls attention to some errors of Krænzlin's (with some reason, for if our own closet botanists often miss the mark a mile how can we expect a Europæan to do as well who by lack of local field work does not know a coulee from a toadstool) and says "A work with such numerous and glaring mistakes reflects little credit to the author, and how can it be trusted?". Rydberg on p. 612 says that Watson never published a Habenaria flagellaris which is literally true, but he seems to be wholly una-

ware that Watson published H. flagellans (Bot. Cal 2 483) which Krænzlin meant. In his key p. 614 Rydberg says "Lip linear i. e. not at all dilated at the base". Now out of the 8 species he has given under this head he figures 4 with dilated base, and H. stricta which he places first would make 5. We repeat "A work with such numerous and glaring mistakes reflects little credit to its author". Though Rydberg must take his own medicine I do not approve of this babyish claptrap style of inferential argument. Because Rydberg was too careless to look in the appendix of Bot. Cal., and Krænzlin's typesetter or copyist misspelled a word proves nothing but Rydberg's special tendency to quibble. Either man might be an expert for all that. If a man had the best proof readers in Government employ behind him, who can spend a week in chasing down a turned letter and put before you a clean proof with all his and your errors corrected it might be different, but most of us have to contend not only with our own exasperating slips but with ignorant or lazy Union linotypers who charge you two prices for butchering your text, anb then compel you to correct all proofs the first of which when corrected is like a war map and margin too small to hold the corrections. Then after about four seances with the typesetter and a few with the proprietor you get so that you cannot see straight up, and so the matter goes to press and you ——. Well, you are grateful that it is over. The value of every man's work is purely a question of keenness of observation absence of bias and willingness and capacity to interpret Nature as he finds it.

The field botanist knows that the western species of Habenaria occur in three well marked groups. One has the bottle-like spur, H. stricta, this is often with lurid (usually green) flowers and then is Rydberg's Limnorchis purpurascens. The other two groups are with slender and falcate spurs at least 5 times as long as wide and variably clavate. One group has green flowers, the other white, and they grow side by side and shade together. The spur varies from $\frac{1}{2}$ as long as the lip to 3-4 times its length, and from filiform to broadly linear, and every sort of leaf variation is found with the varying forms as well as leaf development. The green forms are those with a tendency to excess of chlorophyll in all parts and a diminution of leaf- and increase of bract-surface, with mostly more slender stems and looser inflorescence (effects of ecological conditions persisting through one or two generations only), other forms are the reverse, i. e. succulent stems and small bracts and white flowers. It reminds one of the cleistogamous Viola forms and the reciprocal relations of style and corolla in some borages. Krænzlin therefore was justified in making wholesale reduction of spe-

cies of Habenaria, and in reducing all of the group of hyperborea to one species. This disposes of Rydberg's Limnorchis.

Taking up Piperia Rydberg which includes the H. elegans group, we find Rydberg founding it on the rounded tubers (due to growing in drier soil) as distinguished from the elongated fusiform fleshy roots of the swamp-loving H. hyperborea, and on the few leaves mostly basal and perishing quickly (characters necessisarily attendant on an orchid growing in yellow-pine forests if the leaves are not specialized as in Pyrola or Goodyeara where we find good generic floral differences also. All "Limnorchis" species grow in wet and shady places, mostly in swamps, and of course the leaves do not wither early since the humidity is mostly near saturation. The roots in common with all similarly placed plants need no special appliances and are fleshy and elongated, being as often ovate with a prolonged tip as fusiform. His Piperia on the other hand grows in well drained soil in open pine woods where the humidity is high only in spring and so the leaves not being specialized must die early. The roots must economise and so drop the straggling tips, but do not differ uniformly otherwise. Naturally the flowers average smaller but are not uniformly so. This disposes of Piperia, a little hard on Piper to be so ruthlessly snatched fom the Rydbergian immortals, but I hope he can "grin and bear it"—— or bear it without grinning. Rydberg might try another whack at it by calling one of his to be genera Smokeria, and we by the strenuous use of gray matter could still see the piper in it!

Lysiella Rydberg is intermediate having one leaf and still narrower roots than Limnorchis and grows in the deepest shade. Lysias again has partly the habit of Piperia but in moister and richer soil has the root system of Limnorchis and dies down early to avoid flower and leaf reduction, pretty specific devices but certainly not generic.

I fail to see the consistency of the position of Ames in the new Gray's Manual of Robinson and Fernald in changing Goodyeara to Epipactis and this to Serapias. As far as I can see Haller's Epipactis of 1742 had no species. This is Goodyeara 1813 and Peramium 1812, both genera had species. This is inconsistent with the position toward Rafinesquean genera such as Achroanthes. Ames relegates our species to Serapias which seems decidedly different. Species of our Epipactis were described as early as 1769 (see also remarks of Rydberg referred to above).

LUPINUS. At this time I take up only one group.

L. prunophilus Jones had a line of text omitted. It was collected at Mammoth Utah near the Sioux mine, it is a synonym of L. humicola Nelson which I overlooked. There is no dividing line

between L argenteus and laxiflorus, the normal argenteus calyx is truncate at base, but plenty of forms occur with both truncate and spurred calyx on the same plant. The leaves are normally thick and less inclined to open, while in laxiflorus they are thinner and often flat.

Lupinus laxiflorus var. tenellus (Dougl.) T. & G. is a well defined form with small flowers and flat leaves less pubescent.

Lupinus laxiflorus var. arbustus (Dougl. in Bot. Reg. 1230 as species) is the common Columbia Basin form with large leaves.

Lupinus laxiflorus var. thiochrous Piper is a large-flowered yellow variety of calcaratus Kell. and is probably rightly referred to laxiflorus. This extends from Ketchum Idaho (Mrs. Brodhead) to Mt. Ibapah western Utah (Jones) and through Nevada westward (Wells, etc. Jones).

Lupinus laxiflorus var. argophyllus (Watson Proc. Am. Acad. 8 532 as argenteus var) This has the leaves of argenteus and the calyx of laxiflorus, and runs into all sorts of forms as to pubescence from smooth to densely velvety with yellow pubescence, and as is usual with nearly all the lupines the flowers vary from 8-11 mm. long. This includes L. argentinus Rydberg from my herbarium, pseudoparviflorus Rydberg, pulcherrimus Rydberg. Forms of argenteus are adscendens and laxus Rydberg and alpestris Nelson. L. comatus Rydberg is L. sericeus.

Drudeophytum Clementis n. sp.

This species is a close ally to D. vestita and seems nearest to Podistera. I have named it Pycnothryx Clementis provisionally but put it here for the present till the status of D. Harwegi is fixed which is the type of the genus. Acaulescent perennial from a tuberous and deep root, with a single rather stout peduncle 4-7 cm. long and erect to decumbent and bractless.. Leaf single, radical, on a stout marginless rather fleshy and angled petiole 4-7 cm, long. Blade ovate to deltoid, 1.5-4 cm, long and wide, tripinnate, thick and leathery, the primary divisions short-stalked and the rest sessile. Leaflets obovate, about 2 mm. long, entire, with white and triangular cusp or prickle, and with narrow cartilaginous margins and densely rough-hairy with very stiff short flat and tapering hairs widely spreading. Flowers in a compact terminal head about 1.5 cm. wide. Involucre none or a narrow hyaline wing or sometimes a wide and short hyaline bract. Rays 5-10, very stout, about equal, rarely 4 mm. long. Involucel a broad and fleshy palmate bract, partly clasping, 4 mm. long, 3-5-lobed to the middle with sharp triangular divisions mostly smooth. Flowers mostly sterile, 5-10, and linear-cuneate and 3 mm. long, with conspicuous mooth and

rigid calyx lobes hyaline-margined and widely spreading, 1 mm. long. Ovary densely hairy like the leaves. Petals white. Anthers purple. Fruit oval, about 2.5 mm. long, scarcely ribbed on the back and without evident lateral ribs or wings, rounded, much compressed dorsally and cross section oblong, much like Fig. 83 in Coulter and Rose's first monograph, but much flatter and the edges of the seed nearly touching, and wingless, rounded at both ends, only one seed matured (this probably distorts the normal shape). Oil tubes obscure apparently single in the intervals. Collected by Mrs Joseph Clemens on Mt. Whitney Cal., alpine, also on Kearsarge Pass July 28 1910. The habit is that of the acaulescent species of Cymopterus.

Astragalus Purpusi n. sp.

Didymocarpus-Brazoensis group. A cæspitose perennial, prostrate, much branched throughout, with habit of A. lentiformis and Kentrophyta. Lower internodes very short and rather woody, upper slender and 1.5-4 cm. long, about as long as the leaves, appressed-hairy, round Stipules adnate, connate, hyaline, conspicuous, about 3 mm. long and wide, quadrangular, truncate, hairy above, the uppermost connate only above and deltoid, appressed. Leaves delicate, with filiform rachis, 1.5-4 cm. long, spreading, the small lower ones short petioled, the rest sessile, with about 10 pairs of emarginate and oval-obovate to oblanceolate thick leaflets which are petiolulate and jointed to the rachis, nearly contiguous, smooth above and folded, sparsely appressed-pubescent below, the broader ones about 2 mm. long, and the longer ones 4 mm. long and 1.5 2 mm. wide. Peduncles filiform, in the upper axils only, and ascending, as long as the leaves, with capitate and broadly ovate inflorescence only slightly elongating in fruit and compactly flowered with 10-15 light-purplish flowers 3 mm. long. Bracts minute, not 1 mm. long, ovate, hyaline, a little longer than the flowering and about as long as the fruiting pedicels, persistent. Calyx obconic, equally inserted, appressed-black-hairy, tube about 1 mm. long; teeth triangular, nearly equal, erect, half as long as tube. Banner obovate, about 2 mm. long, abruptly arched to 90° at calyx tips, purple and dark-striped, slightly longer than the broadly-linear nearly straight and blunt and white or purple wings. Keel very broad, straight, the tip rounded to a little more than $\frac{1}{2}$ circle and with the minute tip erect. Pods on a stipe nearly as long as the calyx, pendent on a reflexed pedicel, obliquely ovate, shortly acute at both ends, conspicuously flattened laterally, with triquetrous cross section, ventral suture slightly arched and raised, the dorsal impresssd $\frac{1}{2}$ the width of the pod and then continued

to the ventral as a partition and making the pod 2-celled (a single seed in each cell), pod 4-5 mm. long, about 2 mm. wide, minutely appressed-pubescent, papery and rather strongly nerved. Sierra de Parras, Coahuila Mexico, July 1910, 9,000 ft. alt., C. A. Purpus.

Astragalus Pueblæ n. sp.

Stems filiform and several to many, much branched throughout from an apparently perennial root, widely spreading or decumbent after the fashion of A. Nuttallianus and much resembling it in habit. Stipules adnate, not connate, rather large, triangular, green. Leaves filiform, 5-7 cm. long, ashy with short and appressed hairs, lax. Leaflets 4-5 pairs, about 1 cm. long and 1 mm. wide, folded, linear, petiolulate, the pairs distant about their own length, Petioles $\frac{1}{4}$-$\frac{1}{3}$ the whole. Peduncles nearly erect, about as long as the leaves, filiform, ending in a dense round head of about 10 reflexed flowers. Bracts minute, scarious, persistent. Pedicels filiform, about 2 mm. long, reflexed with age, black-hairy with short and appressed hairs like the calyx. Calyx campanulate or obconic, not noticeably oblique nor compressed, about 2 mm. long, the narrowly triangular teeth about half as long and erect, the lower teeth somewhat the longer. Flowers about 5 mm. long, broad. Banner white, broadly oblong and strongly notched, with closely reflexed sides, about 3.5 mm. long, arched to 45° abruptly at calyx tips. wings obliquely ovate, large for the flower, about 1 mm wide and 1 mm. longer than the keel, purple-tipped. Keel a little declined, $\frac{1}{2}$-deltoid-ovate, about 2 mm. long, purple, the straight not erect tip very broad and barely acute. Pods sessile, brodaly linear, a little wider above, about, 8 mm. long, 3 mm. wide and hardly 1 mm. thick, laterally much compressed, papery, not inflated, deltoid-apiculate, rounded at both ends. somewhat canescent with minute white hairs, cross section cordate-triangular, both sutures prominent but not produced (pod wholly 1-celleb), ventral suture straight to near the tip then convex, dorsal suture inflexed $\frac{1}{3}$-$\frac{1}{2}$ by a strong sulcus which stops short of tip of pod. This belongs to the parvus group. No. 5645 Purpus, Esperanza, Pueblo Mexico, Sept. 1911

Pentstemon aboriginum. P. calcareus Jones Cont 12 69, not Brandegee.

Asclepias Tapalpana. A. Jaliscana Jones Cont. 12 49, not A. Jaliscana Robinson. A friend has called my attention to these duplications.

ARABIS.

A recent examination of this genus in the light of Watson's

revision in the Synopt. Flora shows that his work could hardly be worse. A fairly successful move was the grouping into Sisymbrina and Euarabis, but there it ends. The rest of the grouping rests on stellate pubescence when there is none in the genus, on the variable earing at the base of the leaves, and on the arrangement of the seeds in one or two rows, when everyone knows the seeds are always in two rows. If the pods are very narrow or about 1 mm. wide the seeds mostly appear in one row, but as pods of the same plant sometimes vary 3 mm. in width the seeds are in all degrees of variance as to rows. This wholly unspecific distinction is seized upon by Greene and Nelson as a fruitful source of fictitious species. Another very poor character adopted by Watson (and carried to an absurdity by Greene and Nelson) is the development of ears. Careful field work shows that you can get almost any kind of earing in the same patch of plants; that perennials often bloom the second year; that too little attention has been given to the endurance of species; that too much has been made of the acumination of the pod (except in the arcuata group), the same species varying from acuminate to blunt; that too little has been made of the size of the seeds; and that rows of seeds and so-called "stellate pubescence" are misleading. As a result of Watson's method we know there is an incongruous mass of species on pages 161-2-3 (Synopt. Fl.), while A. Breweri, which belongs with it, is far removed, and A. platysperma with seeds decidedly in two rows is left in it and far removed from suffrutescens, confinis, Lyallii and Drummondii its nearest allies. A. Parishii and Cusickii are side by side though not related. A. microphylla, canescens and Lemmoni are much separated but closely related. A. Cusickii, Beckwithii, subpinnatifida and Holbœllii are widely separated though closely related. A. pulchra and arcuata are widely separated but closely related. The chief character of pulchra is not noted, namely, that its pods are cylindrical till mature, arcuata shows the same varyingly A. arcuata and Holbœllii are the most troublesome species and though treated perhaps as well as can be done they are not satisfactory. We have no evidence what the type of Holbœllii is, can judge only by geographical limitation. The looseness in describing species of Arabis by Watson is the chief cause of our present difficulties. He always considered the Cruciferæ a specially "natural" family which was his way of saying that the distinctions were artificial. In 1882 when I had carefully worked up in the field the western Nevada forms he referred all my material to old species (including my then unpublished A. pulchra). I refrained from publishing my A. pulchra on the express understan-

ding that my name would be respected if he found it was surely now when he came to revise the genus. Later on he kept the pact and also made new species out of three or four others! This and similar occurrences jarred my confidence in the great superiority of the judgment of any closet botanist. Watson I still consider one of America's four (Gray, Engelmann, Torrey, Watson in order of ability, and amount of work) greatest botanists, but he did not work up to his normal standard in Arabis, probably from lack of material as well as field study. An item pointing this way is in at least three species where he gives the pod only $\frac{1}{3}$ as long as it is, and pedicels of A. pulchra are given as $\frac{3}{4}$ line long instead of 3-4 lines long, etc., the latter may be a clerical error. It is not my intion to publish a revision of the genus just now, but rather to describe some forms that appear new.

Arabis Brucæ n. sp.

Related to Holbœllii. Cæspitose perennial from a long and erect tap root. Crowns about 6 mm. thick, densely covered with many rosulate root leaves which are 4.6 cm. long and linear-oblanceolate, acutely slender-petioled, entire, acutish, thin, about 5 mm. wide. Stem leaves narrowly oblong, not reduced above, about 1 cm. long and 3 mm. wide, obtuse, sessile except the lowest, not auricled. Stems with inflorescence 1.5 dm. long, slender, erect, few, arising from the side of the crown. Inflorescence not fully developed, the upper part still in flower. deltoid in outline. Lower pedicels elongating, ascending, 1.5 cm. long, slender; the upper floral ones 2-3 mm. long. Pods smooth, relatively few-seeded, strict, about 6 cm. long and $\frac{3}{4}$ mm. wide, shortly acuminate but stigma nearly sessile, seeds appearing nearly in a single row. Flowers bright-pink, 1 cm. long. Petals oblanceolate to spatulate, about 3 times the greenish sepals. Whole plant smooth, with the appearance of a Cardamine. Hills near Davis Creek Cal., June 1898, in flower only, part of Mrs. Bruce's No. 2251. Summit Cal. Nevada Co. July 10, 1902 Jones, fruit not fully mature.

Arabis salubris n. sp.

Densely cæspitose perennial, hoary throughout, except the pod with compact and much branched short hairs (pods smooth). The crowns rather woody nearly round with many thick and linear-oblanceolate and entire leaves acute at tip and with short and narrow petioles. Root leaves 2-3 cm. long and 3 mm. wide. Stem leaves slightly reduced above, broadly linear, acute, entire, the uppermost only with minute ears, sessile, about 2 cm. long and 3 mm wide. Stems about 1.5 dm. long, erect stout below, mostly paniculately branched. Pedicels stout, ascending, at maturity a-

bout 1 cm. long, 2-3 mm. long in flower. Pods about 5 cm. long and 1 mm. wide, the seeds appearing slightly in 2 rows and narrowly winged, the central nerve going nearly to the tip but the lateral ones faint, pod very flat, with triangular tip and sessile stigma, nearly erect. Flowers purple, erect, about 5 mm. long, the oblanceolate petals about ½ longer than the dark-purple sepals which as in the rest of the genus are oblong and rounded and with narrow byaline margin, sepals less hoary than the leaves. This appears near A Parishii. It grows with A. pulchra on hot mesas at Pleasant Canon Argus Mts. Cal. Tropical Life Zone. May 6 1897 Jones.

Arabis Bridgeri n. sp.

Cæspitose perennial, with several small crowns from a woody and shortly-branched root, with the habit of a Cardamine but not growing in moist ground, and belonging to the A. hirsuta group. Root leaves several to each crown, from nearly oval to spatulate, obtuse and rounded, entire or rarely dentate, thickish, flat, on slender petioles, about 2 cm. long, the blade about ½ the whole, sparingly ciliate with coarse and simple acicular hairs, the surface minutely granular, about 1 cm. wide. Stem leaves sessile, oblanceolate to narrowly elliptical, obtuse, only the uppermost minutely and acutely eared. Stems stout, erect, about 1 dm. long including the narrow inflorescence which is over ½ the whole. Pedicels in fruit about 1 cm. long, stout, ascending. Pods erect, strict, 2 cm. long and barely 1.5 mm. wide, shining, nerved to the tip and with prominent lateral nerves, few-seeded; seeds appearing in one row oblong, wingless, large. Tip of pod acuminate and style 1 mm. long. Flowers gone. This is probably the A. furcata reported by Rydberg from this region. Mt Bridger Montana, alpine, Aug. 10 1905, Jones

Arabis Diehlii n. sp.

A tufted but short-lived perennial and spreading to decumbent from a simple and erect tap root; crowns few. Stems coming from the side, slender, about 1 dm. high, arcuate and tapering. Root leaves very many, entire, thick, strongly nerved, acutish, 3-4 mm. wide, about 2 cm. long or less, the oblanceolate blade fully ½ the whole, strongly beset with very rough hairs which are very coarse, curved, acicular, white and mostly simple. Uppermost stem leaves with rather square and sessile bases but not eared, narrowly oblong, acute, and with the stem and calyx less pubescent than the leaves. Mature pedicels slender to rather stout, 3-8 mm. long, ascending or the tip a little reflexed. Pods declined but not pendent, arcuate, inclined to be a trifle larger above, 2.5 cm. long and

about 2 mm. wide. triangular-acute with sessile stigma, very flat, with seeds conspicuously in two rows and many and small. Flowers about 5 mm. long, erect, light-colored. Petals oblanceolate, about twice the purplish sepals. Subalpine on dry ridges of Mt. Belknap Utah, June 1898-9. To this I would refer material from Santa Fee N. M. by I. E. Diehl, but this has much narrower and longer pods, longer pedicels, and may be A. Fendleri.

Arabis lignifera Nelson. I had given this another name. It is a loosely cæspitose perennial with small crowns and rather woody but short branches of the slender and erect tap root. Stems about 1 dm. long, filiform, ascending and simple from the base of the crown and independent of the sterile and leafy crown adjoining which becomes the stem producer of the next year. Leaves spatulate to oblanceolate, thick, with evident midrib, about 1.5 cm. long, acutish, entire, about 3 mm. wide, densely pubescent with compact and much-branched minute hairs, the slender petiole as long as the blade. Stem leaves narrowly oblong, acute, sessile, the upper ones smooth and minutely and acutely eared, about 1 cm. long. Upper part of stem naked. Flowers few, about 5 mm. long, light-colored. the petals purplish and about twice as long as the sepals. Pedicels nearly 3 mm long, ascending but arcuate at tip so that the arcuate pod is nearly pendent or rarely horizontal. Pods rarely over 3-4 at the end of the peduncles, about 3 cm. long, 1.5 mm. wide, shortly acute with sessile stigma, very flat. seeds rather few, oval, appearing as if in a single row, very narrowly winged. Alpine on the high peaks of the Wasatch and Uintas. I refer here also material from Upper Marias Pass, MacDougal Pk. and Blackfoot Glacier, Montana, Jones, but these have broader leaves and more woody stems.

Cymopterus corrugatus var. scopulicola n. var.
A close ally to C. globosus also, and like it with deep-seated, erect and tuberous fusiform roots, mostly with a single crown. Leaves leathery, rather glaucous. Flowers white, opening in very early spring, the fruit maturing in May. Root 9-15 cm. long and about 1,5 cm. wide, crowned by several hyaline sheaths from which the purple and slender and mostly single stems arise 2-10 cm long and just reaching the surface. Leaves flat on the ground, 2-4 cm. long, ovate in outline, longer than the rather stout and purple petioles, pinnately 5-lobed or incised with the lowest pair of lobes almost distinct and contiguous, the lobes again unequally and incisely and crenately cut or toothed, the tips of the teeth very obtuse and broad and minutely apiculate. Fruiting peduncles purple, rather slender, not longer than the leaves, prostrate. Flowers

in a small and compact cluster, in fruit the umbels are somewhat unilateral by the upper rays being longer (4-7 mm.) than the lower, all fleshy and thick. Involucre none. Involucels of about 5 nearly distinct purple bractlets, 3-4 mm. long, oblanceolate and acute, with narrow hyaline margin. Fruit from nearly sessile to shortly-pediceled, about 6 mm. long and 4 mm. wide from the outside of the wings the outline being cylindrical to oval and emarginate at each end; body of seed flat though slightly concave on the inner face, narrowly elliptical and acute at both ends, about $\frac{1}{4}$ mm. thick and 1.5 mm. wide, with 2 oil tubes on the commissure and about 1 in the intervals. Wings greatly crimped, very cellular-corky, about 1.5 mm. wide to the end of the seed, all about equal or one or two of the dorsal ones very thin but wide, the cross section being lanceolate from the base which is about as wide as the seed ($\frac{1}{4}$ mm.) and the tip a knife edge. This differs from the species in being much more condensed, the fruit forming a compact head, rays few and very short, in the entire bractlets not acuminate nor toothed, and in the much less dissected and smaller leaf. It differs from the var. Coulteri in the few and very short rays and still less dissected and smaller leaves. It grows on rocky mesas or high ridges in the Lower Temperate Life Zone near Sevier Bridge Utah, about 5 miles from the type locality of the var. Coulteri, in sandy or gravelly soil along with C. longipes. May 26 1910. This trip was a special one to re-collect the var. Coulteri which grew on clay slopes, but it was not found though many of this var. were.

Arabis sabulosa n. sp.

Strict biennial, 1-2 ft. high. Whole plant hoary with compactly and pectinately divided and appressed hairs. Root leaves many, rosulate, oblanceolate, mostly with a few coarse teeth, 1.5-4 cm. long, 3-4 mm. wide. Stem leaves densely imbricated so as to conceal the stem, sagittate, oblong-lanceolate, acute, entire or the lower with a few teeth, 6-15 mm. wide, appressed. Inflorescence mostly panicled and with the central raceme twice longer and sessile. Pods 6-7 cm. long, 2 mm. wide, flat, many-veined, obtuse at both ends, a little arcuate, appressed and reflexed with the pedicels also closely reflexed and in fruit about 4 mm. long. Seeds appearing as if in one row. Flowers 8-10 mm. long, white or whitish and with pink sepals, reflexed. Petals spatulate to oblanceolate, with the claws about twice the sepals which are narrowly elliptical often and with narrow hyaline margins. Plants many-flowered. Sagebrush plains from Palisade to Cobre Nevada, Lower Temperate Life Zone.

Arabis sabulosa var. frigida n. var.

This has the pectinate stem leaves nearly like A. subpinnatifida and linear-oblanceolate rosulate root leaves 1.5-3 cm. long, the stem leaves barely auricled. Plants ½-1 ft. high. Top of Diamond Peak, Cal. June 28 1897, nearly alpine, Jones. Flowers barely 8 mm. long.

Arabis sabulosa var. colorata n. var.

Flowers purple, 12-18 mm. long. Petals 3-4 mm. wide, fully 3 times the sepals, including the short claws. Sepals linear elliptical, obtuse, very narrowly margined. 4-5 mm. long, colored. Pedicels slender, 10-12 mm. long, closely reflexed except in youngest flowers. Pods appressed, straight, 4-5 cm. long, barely 2 mm. wide, slightly narrowed at tip. Internodes about ⅓ the leaves which are barely auricled above. Stem leaves 4-6 mm. wide, 2-3 cm. long. Root leaves linear-oblanceolate, mostly entire, as are the stem leaves. Whole plant greener. This approaches A. Holbœllii. Summit, Owen's Valley, Cal. to Weiser Idaho and northwestward.

Arabis pulchra Jones. As I have said above the young pods are round and gradually flatten as they mature till at length they are 3 mm. wide and 1 mm. thick, strongly nerved ⅔ the way toward the tip and with many ascending veinlets starting from the sides and often uniting as pseudo-lateral nerves. The young pods are white with repeatedly forked fine hairs, and gradually become nearly smooth with age, they are conspicuously truncate when young and without any constriction; the stigmatic knob remains to the end, the mature pod becoming shortly-triangular with the knob slightly separated from the rest by a minute neck. Th flowers as they mature become reflexed by the pedicel turning down, at maturity the stout pedicels are closely reflexed and forming a nearly straight line with the pods which are only slightly arcuate and 4-5 cm. long on pedicels 10-15 mm. long in fruit (a little less in flower). The raceme is strict and mostly unbranched. Rarely is even the stem branched at the base in the second year (it flowers the second year), in older plants there are often several herbaceous ones form the woody base which is often 2 ft. long and 7 mm. thick and with a bark. Naturally the herbaceous part is 1.5-2 ft. high. The pubescence is short and close, never strigose. Flowers bright-purple, about 10 mm. long. Petals spatulate-oblanceolate and with the claws twice the elliptical and rounded sepals which are hoary and with narrow purple hyaline margins. Leaves all entire. The root leaves slender, oblanceolate, petioled, 5-8 cm. long, acutish. Stem leaves mostly broadly linear, closely sessile, and the upper ones often with small auricles, 3-5 mm. wide, somewhat reduced above, thick. The type was gathered at Empire City Nev.

and grows in the lower part of the Lower Temperate Life Zone on sagebrush mesas, the species extends from northern Nevada along the eastern base of the Sierras at least as far as San Felipe near the Mexican border, also eastward as far as Goldfield, Tonopah and Death Valley, but farther eastward is replaced by the var. Munciensis, and northward by A. arcuata. All material from Oregon referred here and seen by me is A. arcuata. The seeds are clearly in two rows.

Arabis pulchra var. Munciensis n. var.

Flowers about 8 mm. long. Petals nearly obovate, purple. Pods not appressed, pendent on nearly horizontal pedicels, 2-2.5 mm. wide. All the upper leaves auricled, the lowest less so and nearly obovate-spatulate, 1.5-3 cm. long. Eastern Nevada from near Ibapa western Utah and westward. This looks like a hybrid between arcuata and pulchra, but neither parent grows with it.

Arabis pulchra var. pallens n. var.

Flowers nearly white, about 10 mm. long. Petals broadly oblanceolate, more than twice the sepals. Pedicels about 5 mm. long, reflexed and with the pendent pods rather appressed and 2 mm. wide and with a distinct thick beak longer than the width of the stigma. Leaves all linear or very narrow, not auricled. This is the only form in the Navajo Basin. First collected by me in 1883. It extends from Price to Grand Junction.

MONTANA BOTANY NOTES,

Additions.

During the season of 1910, in company with Prof. M. J. Elrod Director of the Biological Station and Prof. Kirkwood, I made a tour of the Glacier Natl. Park. We reached Somers on the beautiful Flathead Lake on July 31st. A day was spent there and an Opuntia was collected which Dr. Rose has described as new (but which I regard as only a small form of O. mesacantha) and some other plants new to the region. We all reached McDonald Lake Aug. 1st. The object of this trip was to complete the examination begun in 1909. In that year we visited the lake, Sperry Glacier, the Continental Divide, and Gunsight Pass and Lake and Blackfoot Glacier, on the Hudson Bay slope. In 1910 we spent four days at Avalanche Lake, about a week at Mineral Park and Swift Current Pass (Continental Divide), thence over on the Hudson Bay slope to Waterton Lake just on the British line, thence over Brown Pass to Bowman Lake and Adair, thence southward to McDonald Lake. The trip took a month. The botanical work was thorough till we dropped down toward Waterton Lake; from there the trip was too hurried. Good moss collections were made at McDonald Lake, Mineral Park and Greenwood's Camp near Waterton Lake only. Little was done with lichens or fungi except to get anything noticeably different. Hydna were collected, several species but not identified. Messers Holzinger, Fink and Peck named species as before.

Mosses.

Sphagnum undulatum var. teretiusculme x flavescens Roell. Waterton Lake.

Wilsoni var. quinquefarium forma humile Roell. Mineral Park.

Dichodontium pellucidum Sch. Greenwood's Camp.

Dicranum Bonjeanum De Not. Greenwood's Camp, Waterton Lake.

fragillifolium Lindb. McDonald Lake.

fuscescens Turn. McDonald Lake, Mineral Park, Waterton Lake, Brown Pass.

longifolium Hedw Avalanche Lake, Swift Current Pass, Greenwood's Camp.

scoparium Hedw. Avalanche Lake, Brown Pass.

Dicranum montanum Hedw. Greenwood's Camp.
crispulum Lindb. Greenwood's Camp.
congestum Brid. Greenwood's Camp.
brachyphyllum Ren. & Card. Mineral Park.
Ceratodon purpureum (L.) Brid. Waterton Lake, Greenwood's Camp.
Rhacomitrium canescens Brid. Mineral Park, Greenwood's Camp.
heterostichum Brid. Greenwood's Camp.
patens Hub. Avalanche Lake, Greenwood's Camp.
Sudeticum R. S. Mineral Park, Greenwood's Camp.
Hedwigia ciliata (Dicks.) Ehrh. Avalanche Lake.
Encalypta commutata N. & H. Alpine at Mineral Park.
Orthotrichum speciosum Nees. Waterton Lake.
Tetraphis pellucida Hedw. McDonald Lake, Avalanche Lake
Funaria hygrometrica (L.) Hedw. Greenwood's Camp.
Bartramia ithyphylla Brid. Mineral Park.
Philonotis fontana Brid. Mineral Park.
new species, not named. Alpine, Swift Current Pass.
Webera nutans Hedw. Avalanche Lake, Greenwood's Camp.
Bryum pallens Sw. Mineral Park.
crispulum Hampe. This very rare alpine species was found at Mineral Park. Heretofore found only arctic in America and in Norway.
pseudotriquetrum Schw. Mineral Park.
Mnium spinulosum B. S. Greenwood's Camp.
punctatum Hedw. McDonald and Avalanche lakes.
serratum Laich. Mineral Park, Waterton Lake.
Aulacomnium androgynum Schw. Mineral Park.
papillosum L. & J. Mineral Park, Bowman Lake.
Timmia austriaca Hedw. Avalanche Lake.
austriaca var. brevifolia R. & C. Waterton Lake.
Pogonatum alpinum Roehl. Mineral Park.
Polytrichum juniperinum (Hedw.) Willd. Avalanche and Waterton lakes, Greenwood's Camp
sexangulare Flœrke. Mineral Park.
commune var. minus Weis. Mineral Park.
pruinosum Hedw. Mineral Park.
Climacium dendroideum (L.) W. & M. Waterton Lake.
Tortula pseudoaciphylla (Kindb.) Brot. Avalanche Lake.
Pseudoleskea pallida Best. Mineral Park.
radicosa (Mull.) L. & J. McDonald Lake.
Hypnum ochraceum Turn. Mineral Park.

Hypnum Schreberi Willd. Avalanche Lake, Greenwood's Camp.
symmetricum R. & C. McDonald Lake.
crista-castrensis L. Avalanche Lake, Greenwood's Camp.
filicinum L. Greenwood's Camp.
turgescens Sch. Mineral Park, alpine.
stellatum Sch. Avalanche Lake.
Richardsoni L. & J. Greenwood's Camp.
Hylacomium robustum var. Jonesii C. & H. n. var. Mineral Park.
Webera cruda x Aulacomnium androgynum. McDonald Lake.

Hepaticae.

Blepharostoma trichophyllum (L.) Dumort. McDonald Lake.
Jungermannia cordifolia Hook. Mineral Park.
lanceolata. McDonald Lake.
Lophoria porphyrolenca. Avalanche Lake, McDonald Lake.
Baueriana. Swift Current Pass, Greenwood's Camp.
incisa. McDonald Lake.
Porella rivularis (Nees) Trev. Mineral Park, Somers.
Ptilidium ciliare (L.) Nees. McDonald Lake.
pulcherrimum. Greenwood's Camp.
Plagiochila ospleoides. McDonald Lake.
Marchantia polymorpha L. Greenwood's Camp.

Lichens.

Alectoria Fremonti Tuck. Rogers's Ranch.
circinata Fr. Avalanche Lake, Mineral Park.
Cetraria glauca (L.) Ach. Somers.
Islandica var. crispa Ach. Greenwood's Camp.
Cladonia fimbriata (L.) Fr. and var. simplex. Waterton Lake
gracilescens (Rab.) Weimo. Swift Current Pass.
pyxidata (L.) Fr. Greenwood's Camp.
gracilis var dilacerata Flœrke. Greenwood's Camp, Avalanche Lake.
cariosa (Ach.) Spreng. Waterton Lake.
var. aspera Flœrke. Greenwood's Camp, Waterton Lake.
Evernia vulpina (L.) Ach. Brown Pass.
Parmelia olivacea (M.) Ach. Somers.
physodes (L.) Ach. McDonald Lake.
saxatilis (L.) Fr. Somers, McDonald Lake.

Peltigera aphthosa (L.) Hoffm. Avalanche Lake.
spuria Ach. Waterton Lake.
canina (L.) Hoffm. McDonald Lake.
Solerina crocea (L.) Sch. Swift Current Pass.
Sticta pulmonaris (L) Ach. McDonald Lake.
Usnea barbata (L.) Fr. McDonald Lake.
Rhizocarpon oidoleum var. penicrum (Tuck.) Fink. McDonald Lake.
geographicum (L.) DC. Avalanche Lake.
Thcloschistes polocarpus (Hoffm.) Tuck. Somers.
Nephroma lævigatum var. parile Tuck ? Greenwood's Camp.

Fungi.

Fungi were as scarce as they were abundant the first year.
Cintractia Caricis (Pers.) Magn., on Carex Montanensis. Mineral Park.
Peridermium Balsamineum Peck. Avalanche Lake.
occidentale Arthur. Avalanche Lake.
Erysiphe cichoriacearum DC. On Aster conspicuus. Waterton Lake.
Puccinia aberrans Peck. Mineral Park, Swift Current Pass.
Omplialia campanella. Avalanche Lake.
Uredinopsis Cepelandi Syd., on Aspidium Filix-Mas. Avalanche Lake
Uromyces ———. On Clintonia borealis. McDonald Lake.

Higher Plants.

Tsuga Mertensiana (Bong.) Carr. was collected by Prof Kirkwood in the Idaho strip on the edge of Montana, and by myself again in the Cascades in subalpine places. Its general appearance is that of the larch or a ragged spruce, not at all that of the other graceful hemlock.

Equisetum sylvaticum L. Avalanche Lake, Greenwood's Camp.
Agrostis ampla Hitchk. ? Avalanche Lake.
Bromus inermis Leyss. Greenwood's Camp.
vulgaris var. eximius Shear. Waterton Lake.
erectus Huds. Mineral Park.
Danthonia thermalis Scr. Mineral Park.
Carex saxatilia L. Bowman Lake.
amplifolia Boott. Mineral Park.

Tofielda palustris Huds. Blackfoot Glacier.
Allium stellatum Fras. Flathead Lake, Elrod, 1905.
Ranunculus ramulosus n. sp.

Alpine and cæspitose perennial, with fibrous roots. Crowns very short and erect. Root leaves reniform, leathery, with the blade about ¼ the petiole, 2.5 cm. wide, 3-cleft to the middle and with the lobes 3-cleft or crenate, these leaves mostly 6-8-lobed with all lobes rounded, oval to obovate, smooth, venose. Stems nearly filiform, decumbent or straggling, with 1-2 leaves near or above the middle, these leaves 3-5-cleft and with sessile to petioled oblanceolate and obtuse lobes 1-2.5 cm. long. Peduncles flexuous, filiform, often bracteate in the middle, 2.5-13 cm. long. Flowers small, yellow. Heads oblong, small. Akenes half-oval, rather sharply ribbed on the edges and a little flattened, with very short beak hooked and not ¼ the whole. Plant entirely smooth. Petals oblanceolate, longer than sepals. This differs from R. Eschscholtzii in the reniform and nearly equally crenate-lobed and leathery leaves with obtuse and not acute tips, and the very short hooked beak. Swift Current Pass.

Arabis lignifera Nelson. Alpine, Mineral Park.
Spraguea umbellata Torr. Mt. Haggin.
Elatine brachysperma is Callitriche. (See Notes).
Stipa spartea var. Tweedyi (Scr.) Jones. Eastern Montana to Flathead Lake.
Juncus castaneus Sm. Brown Pass.
Regelii Buch. Lone Pine.
Romanzoffia Sitchensis Bong. Alpine. Mineral Park, Sperry and Blackfoot glaciers and Lambert valley on McDonald peak.
Vaccinium membranaceum is misnamed since the leaves are membranous only when young.
Myrtillus L. Waterton Lake.
Gaultheria Myrsinites Hook. (humifusum (Graham) Rydb.) Mineral Park.
Erigeron alpinus L. Mineral Park.
The following interesting plants, among others, were collected by Prof. M. J. Elrod in the Park in 1911.
Dodecatheon pauciflorum Greene. Iceberg Lake.
Omphalodes Howardi Gray. Brown Pass.

SEXTUPLE BOTANY.

They say that there is nothing new under the sun, but this is a delusion of the ancients.

Rydberg, in Torr. Bull. Vol. 37 in commenting on Nelson's Coulter's Flora, says that he thinks no genus should contain more than six species, his conception of species being meant of course.

This great pronouncement effectually eclipses that wonderful Brittonio-Covillean emanation "Once a synonym always a synonym", while Greene with his multitudinous Eschscholtzias and dogbanes is relegated to the race suicide class. It is too bad to so ruthlessly and suddenly snatch from him this malodorous supremacy and at a time when advancing years and the tremendous handicap of absence of any access to that Ponce de Leon fountain of metropolitan botanical inspiration makes a suitable defense impossible. There ought to be some statute covering the case. He might invoke the law against cruelty to animals (and would receive the support of all systematic botanists), or the antitrust law, covering botanical inspiration. Or failing in that Greene could tackle Astragalus and, if his work on Eschscholtzia and Apocynum is any index, he could make over half a million species and so work Rydberg's sextuple genera to death. What a frightful drain all this would be on the already much-abused Latin and Greek.

Since Rydberg would get the worst of it we should all rush to his aid. There are at least twenty fairly good varieties of Astragalus lentiginosus which he would make into species, it would be a good idea to keep a string on them to prevent their being lost in the shuffle when they are "segregated" into half a dozen or more new genera, and in addition we should by all means properly perpetuate the memory of these great botanical creators.

My systen would work out like this for A. lentiginosus var. Coulteri (Gray) Jones —— Rybergia-Astragalo-lentiginosa Coulteri (Gray) Rydberg. After Greene had taken a whack at the var. and made a few hundred species out of it Rydberg would have to take a second hitch at it and one of the new names would be this Rydbergiax(Greenea-Astragalo-lentiginoso-Coultera septem-bughola (Greene) Rydberg.

GREENE AND HIS SPECIES.

In a brochure of not long ago E. L. Greene complains of the way the botanical public has received his proposed new species, intimating personal prejudice. He shows that in certain cases he is no worse than Coulter, Fernald, Rydberg, Nelson and others, and he goes to great length to quote new species, proving that many authors have greatly increased the species in floras over the plants recognized a generation ago. This kind of special pleading is always the stock argument when a man is wrong. Because Fernald and Coulter got in the mud over their shoe tops and Greene and Rydberg over their heads is no proof that the former are muddy and the latter clean. Because a generation ago half of the flora was almost unknown is no evidence that the present increase of species is due to changed views among real botanists as to specific limitations. Greene is always side-stepping the main issue, which is this, Do his species represent stable plant forms, or are they individual variations? We who study our plants as they grow in the field and by thousands know that 95% of his species have no foundation in fact, and no amount of botanical juggling or dust throwing can obscure that fact. The indictment western botanists bring against him is that he is grossly ignorant of primary facts in plant ecology or deliberately dishonest. His work on Eschscholtzia and Apocynum is the acme of botanical drivel, as every one but himself knows, and differs in no esssntial particular from a typhoid fever patient in the last stages picking at the bedding. As to personal prejudice it is unfortunate that one's most intimate acquaintances say the hardest things. The private character of a man is a real part of his scientific character for on that depends his reliability. If a person says as Greene did before he left California that he would devote the rest of his life to undo the work of Asa Gray, he has no one but himself to blame if the botanical public sees in that an adequate explanation for his erratic treatment of Grayan genera and species. That Gray, the greatest botanist this country ever knew, overestimated his closet kowledge of western plants is now generally accepted, but his autocratic work in trying to suppress the publication of new species by Greene and myself is not so well known, but it is a fact. The files of the Torrey Bulletin and Botanical Gazette in the eighties will show that both journals were as subservient as the former became flagrantly insurgent after the death of Gray and Watson, for they published

a compact that they would publish no new species unless the types were deposited in some of the eastern herbaria, but in private they went much farther. I was publishing in both journals. I received a letter after my last article in the Bulletin (from Gerard the Editor) saying that Gray had objected to my new species as not authorized by him, and that I should get his approval hereafter. I replied that I would submit to the dictation of nobody. I did not feel hostile to anyone though I felt that it was pusillanimous and the publication of the compact later was equally so in both journals. The compact made my hebarium valueless as to types and insured the easy access to them by closet men and made it imperative for us to make expensive pilgrimages 2000 miles to see types which the closet botanists did not know how to describe. The private orders required Gray's approval and gave Harvard the types, a fine thing —— for Harvard. After a while Columbia eased up a bit and let Greene publish without Gray's approval on depositing types with them. I did not publish or attempt to for some time but I kept up my correspondence with Gray and Watson and they published as mine any species to which I gave a name if they thought it was good. I had many friendly tilts but I knew they were often loose in their descriptions, and so I could not be sure of my ground till I saw their types, which did not occur till 1895 when both were dead.

From Gray's viewpoint we were enthusiastic collectors like Cusick, Lemmon and many others who sent him much material, and for whom among others he was running a race with Death to complete his great Flora. In addition we knew his types from meagre and often faulty descriptions, and consequently made errors constantly. On our part we were not satisfied with all his names for we knew that he erred in describing his types or in his identifications. This was hightened when Watson adopted my opinion on Arabis and got the credit for half a dozen species that by right belonged to me.

Because of these facts one of us has lost his botanical moorings and dritfted out into the fog, and it is pitiable, still more so because he is writing a history of American botany where he can fatten his spleen on unfair references and belittling estimates of at least one of the World's greatest botanists.

THE COLUMBIA BASIN.

In my work of unraveling the ecological facts of the Flathead Lake region and western Montana some problems arose that I could not solve there. It was established that the flora is almost identical with that of the Blue Mts. of Oregon and the Cascades though separated by the enormous barrier of the Columbia plains, a barrier that in the Great Basin would make marked changes in the flora. A dubious explanation was possible in that much overworked theory of migration, around by the Blue Mts. and the Selkirks, a slow process. Another disturbing geological problem was the origin of the lake beaches so high up, at least 4200 ft. alt., the base level being hardly 3000 ft., which has not been satisfactorily explained by Montana geologists. They have assumed a great rock slide in the canon below Missoula or a glacial moraine damming back the water, but neither occurred, and in addition the same beaches are found at the same level outside the Bitterroot in the Flathead and Little Bitterroot and down the Missoula valley to Thompson Falls where it debouches into the Columbia Basin proper. I had no chance to carry the problem farther till 1911 when I traversed the whole Columbia Basin twice as far as Chopaka Peak in the Cascades. I went from Pocatello Idaho down Snake river valley, around the Blue Mts. to Spokane, thence to the British border and along it to Oroville and Chopaka, thence down the Okanogan and Columbia to Lake Chelan and Wenatchee.

Throughout the Columbia Basin at the north enormous glaciers filled all valleys and the ice sheet capped most of the mountains as is shown by the scorings going straight over the hills. This insured the presence of a long line of great terminal moraines west of Spokane under normal conditions. At Oroville, though less than 1000 ft. alt. the glaciers had debouched far to the southward leaving only local moraines and beautiful gems of lakes in every nook, a geological Paradise. Anticipating a great treat I descended the Okanogan toward Chelan, expecting to soon come upon the great moraines. All around were the benches even up to 4200 ft. alt., supposedly river terraces, but along the river it was sand and everywhere in bars and benches, and the farther south I went the more sand and less boulders, but no moraines terminal or lateral to speak of, and so it was all the way down the Columbia to Chelan. At Chelan Falls the Chelan glacier debouched and left

only a terrace of sand. There is but one agency that could produce such effects, a sea sufficiently deep to float off the glacial ice in bergs and filling the whole Basin and thus preventing the formation of moraines, as must have occurred otherwise. This unexpected discovery solved all problems of plant distribution in the region as well, and entirely changed the conception of Shoshone Lake, a name given to the arm of the great Columbia Lake which filled the Snake river valley from near Pocatello to Huntington Oregon. The Flathead and the Bitterroot also were arms. With this new viewpoint I was so fortunate as to retraverse the whole region, nearly, in the fall. I traced the lake beaches of the Columbia Lake from near Chopaka peak to Spokane and the Flathead arm beyond Missoula, a distance of over 1000 miles. I saw abundant evidence. There were river terraces but most of the large ones so conspicuous on the Okanogan were lake beaches as was shown by their filling all the coves where river action would be absent. This fresh water lake was wholly distinct from the Tertiary lake and did not drain away till after the close of the glacial period as is shown by the absence of moraines far up toward the head even of Chelan canon which was the longest-lived glacier. The existence of this great glacial lake explains why there is no terminal moraine at Thompson Falls, only a delta, and why there is no more erosion there than in most river (not glacial) valleys. It does away with the violent assumptions to account for the Bitterroot Lake at Missoula, for the boulder-speckled surface of the Basin and, best of all, accounts for the similarity of the flora of the Flathead, Blue Mts. and Cascades. It also explains the character of the soil especially that overlying the Tertiary lava flows which for the most part overlie the Tertiary lake beds. It also does away with the assumption that the Tertiary lava flows near the Wallowas of eastern Oregon caused Shoshone Lake. This Columbia Lake, as I have named it, also covered the Salmon watershed and all the strings of lakes in southern British Columbia to the Fraser river.